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THE AUTOGRAPHIC TELEGRAPH.

The accompanying engravings represent an autographic or copying telegraph instrument, the invention of Mr. Sylvester P. Denison, which is being introduced by the New York Auto-Telegraph Company, of 47 Broadway, this city. With the aid of these instruments, suitably connected by wires, it is possible for any one to send facsimile copies of messages from place to place. The message is written upon a narrow strip of bronzed paper, which is placed over a roller at one side of the instrument; the movement of a lever sends an electric current through the machine, out over the line, and through a second similar machine. The current moves a stylus, which vibrates rapidly over and in contact with the bronzed strip; each time the point in its passage across the paper meets the ink of the writing the current is broken, when a second current passes over the line to the other instrument and through a like stylus, moving back and forth across a strip of paper so prepared as to be discolored whenever the current passes through it. As the two styluses move absolutely in unison, the exact location of each particle of ink that causes a break in the current is reproduced, by electrolysis, on the chemically prepared strip at the second instrument.

The machine requires no attention beyond the switching of the current from the transmitting to the receiving side, as may be required.

Fig. 1 is a perspective view of the instrument, Fig. 2 is a plan view, showing the arrangement of the various parts, and Fig. 3 shows the construction of the mechanism for feeding the strips of paper, and the pole changer. Each instrument is provided with two sets of operating parts, permanently fixed on either side of the feeding device, one to be used for transmitting and the other for receiving, and the connections are so made that when one side is in use the other is switched out of the circuit.

The electro-magnets, E E', are attached by screws to the permanent magnets, D D', which are connected in pairs so as to form practically but one, and which are similarly located as to their poles. The electro-magnets can be advanced or withdrawn by the screws. The armatures, H H', are pivoted so as to vibrate, and are furnished with the rebounding springs, *d d'*, which, by the motions of the armatures, are brought alternately in contact with the screws, *e e'*, set in the ends of the permanent magnets. Fixed to one end of the armatures, and insulated from them, are the contact springs, J J', the free ends of which act on the relay points, *g g'*, set in the posts, K K', and connected on the under side by wires to the two field magnets, U U', in such a manner as at each vibration to bring these magnets alternately into the circuit of a local battery. Secured to, but isolated from, the armature pivots are the arms, L L', having at their extremities the electrodes or styluses, M M', arranged to maintain a delicate contact with the paper as they vibrate over its surface.

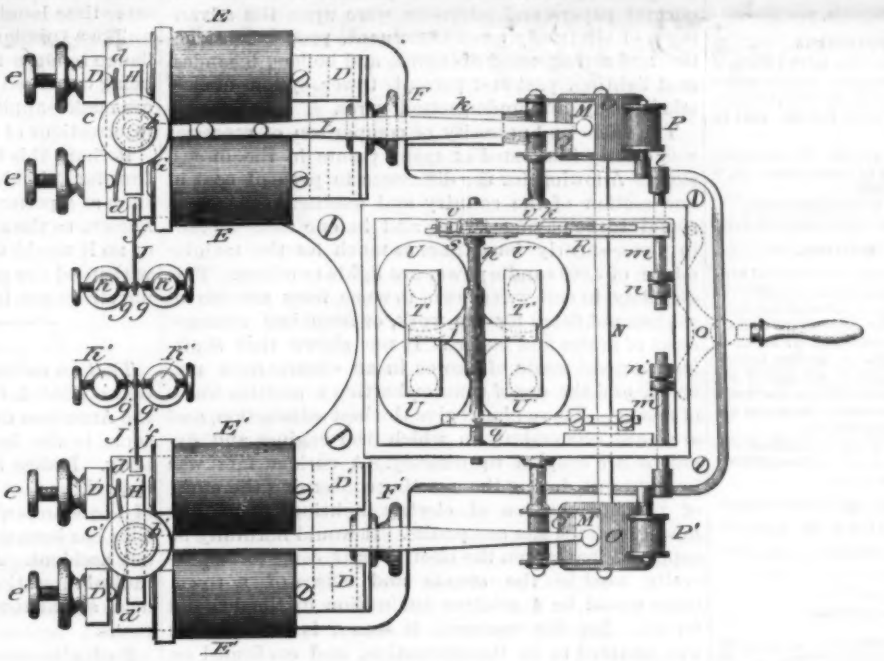

Fig. 2.—PLAN VIEW SHOWING ARRANGEMENT OF PARTS.

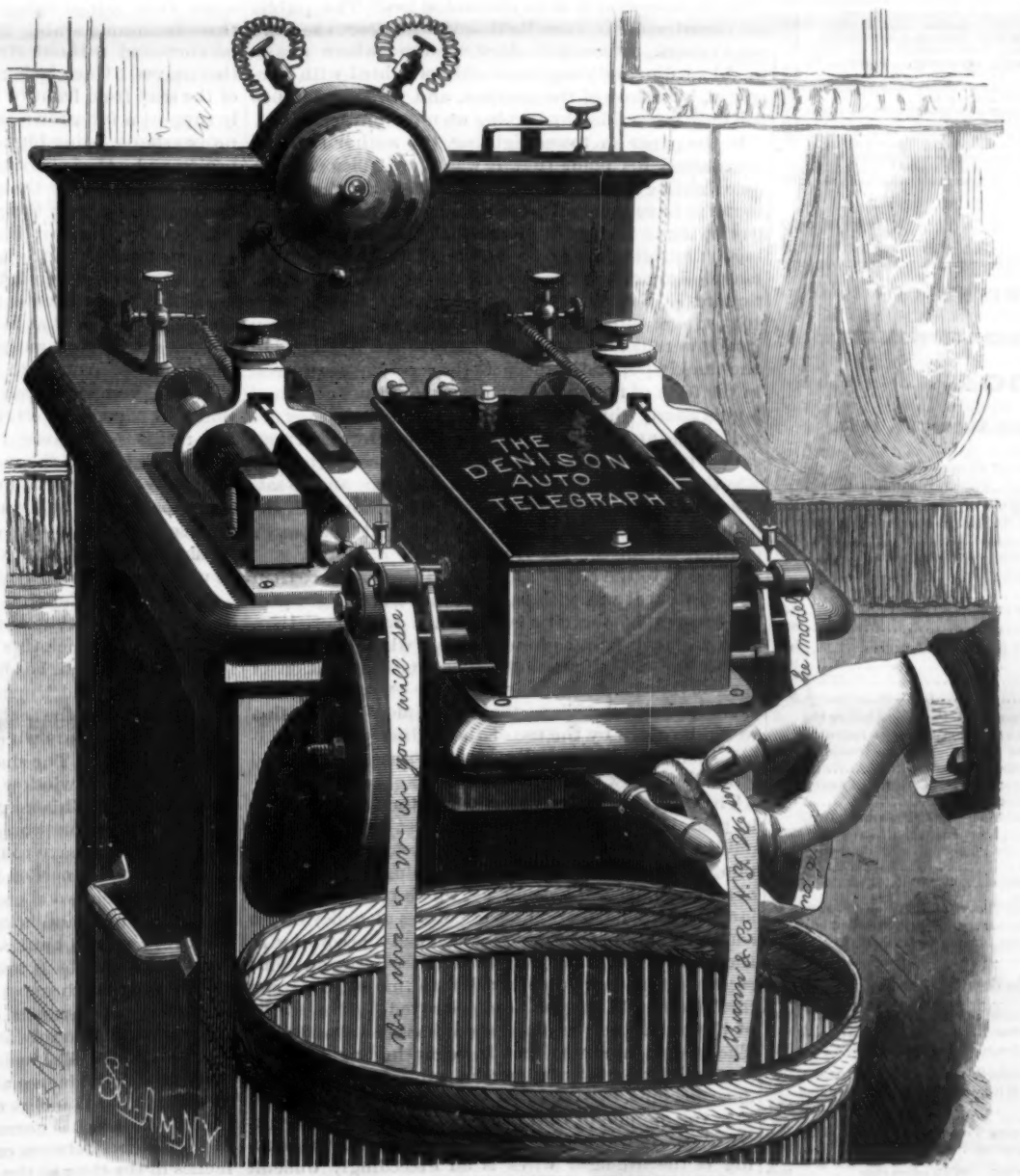

Fig. 1.—THE AUTOGRAPHIC TELEGRAPH.

The feed mechanism is mostly contained in the box, C, and consists of the magnets, U U', their connected armatures, T T', which, as the magnets are alternately energized, impart a tilting or rocking motion to the shaft, *h*, to which they are fixed, the lever, S, also fixed to the shaft, pawls, *k k'*, ratchet wheel, R, and the escapement, V, with its connecting levers. As the rocking motion is imparted to the lever, S, the pawls engage alternately in the teeth of the wheel and cause it and its shaft to revolve step by step. By means of the escapement only one tooth is allowed to pass at each movement, thereby preventing irregularity of the feed. The shaft, N, extends through the sides of the box, and on each end it carries one of the feed rollers, O O', which are about the width of the paper strip; they are adjusted so that their center line is opposite the electrodes, M M', when the latter are at rest. The friction rollers, P P', turn freely on spindles set in the arms, *l l'*, attached to the shafts, *m m'*, which have arms, *n n'*, extending down through slots in the base, so that the cam lever, *o*, as it is moved to the right or left will alternately bring one of the rollers in sufficiently close contact with one of the feed rollers to firmly grip the strip of paper, while the other is removed to leave the paper free. Thus while both feed rollers are constantly revolving, when the machine is being operated, only one strip of paper is feeding. The strips of paper are guided by metal plates, Q Q', supported on studs secured in the sides of the box. On the transmitting side a wire brush maintains a metallic connection continually on the transmitting strip; the brush is thrown back when that side of the instrument is not in use.

The pole changer has three plates on the periphery of a wheel and two contact rollers, as shown in Fig. 3. A rocking motion, sufficient to carry alternate plates under the two rollers, is imparted to the wheel by an arm, *r*, attached to the rocking shaft, *h*. This motion reverses the polarity of the line in which the magnet, E or E', is placed and causes the armatures, H or H', to vibrate one stroke, and by the contact spring, J J', and one of the relay points, *g* or *g'*, to actuate the opposite pair of the feed magnets, U U', which by attracting its armature rocks the shaft, *h*, in the reverse direction, when the arm, *r*,

(*Continued on page* 132.)

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NEW YORK, SATURDAY, AUGUST 29, 1885.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 504,

For the Week Ending August 29, 1885.

Price 10 cents. For sale by all newsdealers.

MEETING OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

However skillful the mechanician, he may reasonably hope to gain something by a comparison of work with his fellows. The one may have found a simple means of performing what before was a difficult operation, and the other hit upon a plan reducing the cost of operation. Let them come together and exchange ideas, and it is readily seen that both will be benefited. This comparison of work is of the most importance where new processes are in course of development. Seeing this, the electric lighting fraternity have at last bestirred themselves, and formed an organization for mutual advantage and instruction. This organization, called the National Electric Light Association, met last week at the Union Square Hotel, New York city, and the three days' sitting of the convention brought out much that is interesting to the general public and a great deal that is of importance to those engaged in operating electric lighting plants. The most important papers and addresses were upon the advantages of electricity as an illuminant, proper construction and arrangement of engines and boilers, incandescent lighting, past and present, tower system of electric lighting, and underground wires.

The value and necessity of comparison of processes was clearly illustrated at many points in the discussions. Allowing for the difference in price of coal in one section of the country and another, some were found to be paying twice, and in one case—a plant in Iowa—nearly four times as much for the maintenance of 2,000 candle power arc lights as others. This disparity in cost was shown to come from the use of engines not fitted for the work, or from bad arrangement of grates and boilers. It was shown that shafting is a great waste of power in an electric light machine, and the use of countershafting a positive waste of money. Those plants give the best satisfaction, and are most economical, in which the engines and dynamos are coupled up directly. A curious fact was brought out during the meeting concerning the effect of the introduction of electric lighting upon the business of the gas companies. It would naturally be supposed that, when the electric light came to be generally used in the streets and offices of a town, there would be a relative diminution in the demand for gas. Yet the contrary, it seems, is the case. It was testified to in the convention, and confirmed on all sides, that wherever the electric light was introduced the gas companies greatly increased their business. This phenomenon is thus accounted for: The public get accustomed to more light, and therefore use more gas burners. Stores and show windows where gas is used look dim and dingy near others lighted with electricity, by reason of the contrast, and this appearance can only be rectified by turning on more burners.

In the paper on tower lighting, the author scarcely maintained his point that it was more efficient than pole lighting for the illumination of cities, though it seems to have some advantages, notably that of being less trying to the eyes. He cited the case of the lighting of Detroit, Mich., by a system of iron towers and masts, similar to those in use in Union and Madison Squares in New York city. The area to be lighted is 10½ square miles. The system comprised 90 skeleton iron towers, being for the most part 150 feet in height. In the thickly populated districts these towers are placed in the form of triangles, something less than a fifth of a mile apart, while in the outskirts of the city they are half a mile apart. There are nearly four hundred 2,000 candle power voltaic arc lights in all, and so thoroughly was the city illuminated by these last year, and so satisfactorily, that the citizens, so the author said, demanded the renewal of the electric light company's contract for the coming year.

The cost to the city of Detroit is, it seems, more than double what it was with gas, but the electric light people insist that the city is furnished with more than twice as much light as formerly; and whether this is so or not, the city inferentially shows its appreciation of electric lighting by its renewal of the contract, though there is reason to believe that even more satisfaction would be given by the use of the ordinary pole lighting, such as is in use in Broadway, Fifth Avenue, and other New York streets.

The paper on underground wires, though the last to be read, is perhaps of the most interest to the general public, owing to the present controversy and complication. The author began with something like a eulogy of a certain telegraph company, which has not particularly attracted attention for broadness of policy or for commendable practices. This company, according to the author, began burying its wires ten years ago, but recently it has been discovered that the gutta percha insulation of its line has been destroyed by the effects of the steam heating pipes, and it has been abandoned. The system used was that in vogue in England—the simple drawing of gutta percha cables through ordidary gas pipe.

In the opinion of the author, and he has had an extensive practical experience in such matters, the sinking of the arc-light wires is an exceedingly difficult problem, which will require much thought and many dollars to solve. He said: "So far as the arc-light companies are concerned, the present movement is well timed, as reconstruction would have to be begun in any event. The present lines are not of a permanent character, and the insulation is not in the best condition. I believe that the subway commission will prepare a plan for the accommodation of all services, and that when it is carried out, all companies can by lease or purchase obtain perpetual rights in such subways. No system will be approved that is not sufficiently comprehensive to meet the demands of all classes of service." But later on in the paper the problem of burying the arc-light wires appeared not to be so difficult after all, for the author described a system of underground conduits now in use in Chicago, in which these arc wires work well along with telephone and telegraph wires. This conduit, he said, is made of concrete, the result of mixing asphaltum and silex, and is moulded and at the same time hammered into lengths of about three and a half feet, through which are formed at the same time longitudinal ducts, the whole looking not unlike a tubular boiler. One end is provided with a flange to allow for the secure joining of the section; being cemented with the same material of which they are made—applied hot. Manholes are arranged at the intersections of the streets for renewing and repairing.

Perhaps this Chicago line, though entirely successful thus far, should be regarded as a makeshift, rather than as a permanent construction. For it is not yet known, as the author inferentially admitted, whether or no it would withstand the test of time as well as it withstood the government test of 5,500 pounds crushing strain per inch.

CAR SEATS.

That an entirely new departure in car seat construction is needed is apparent to any one who has studied the American car. One difficulty to be met and overcome is the insufficient width of the American car body. Bodies from twelve to eighteen inches wider than those now in use may safely be carried on trucks of the standard gauge, even at high rates of speed. This has been done for years on the Erie road, without accident. A wider car would, however, call for radical alterations in stations, platforms, bridges, tunnels, signal towers, and even in the tracks of some roads.

Such alterations and improvements cannot be looked for at present. More room in the seats can be obtained by sacrificing one seat in the width of the car; the space thus gained being given to the aisle and the three remaining seats. Many faults of car seats may be corrected without structural changes in the cars themselves. One glaring fault is the insufficient width of the seat, from front to back, which does not properly support a full-grown person. The cushion is of improper shape, being highest in the middle; a form made necessary by the reversible back, although its convex form is much better than those in which an attempt has been made to fit the person. The back is too low to comfortably support the head and shoulders, yet it projects from seven to eight inches below the level of the seat, and is so much too wide. This wastes a large quantity of expensive covering material. Most backs do not give support at the proper place, and are convex on the corners, where concavity is needed. They should be convex both horizontally and vertically. The seat, from seventeen to eighteen inches high at the front edge, is about right for a six-foot man, yet the foot rest is too far away to be of use even to a tall person, and is beyond the reach of others. With a practicable rest the present height would be proper. The seat frame, while bulky and heavy, is not strong, and is placed so low that there is no room beneath the seat. By simple modifications of the frame, this space could be utilized and made available for satchels, etc.

Another evil belonging to the reversible back is the necessity for making the seat parallel with the floor. A tilting seat, which tips the frame one-half or three-quarters of an inch, has in a few cases been adopted. It costs much, and the advantage is not appreciable. The inner end of the seat is well covered with catches, mouldings, and bars which search out tender portions of the anatomy. The sharp moulding is architecturally correct on the window rail, because as a cornice it crowns a wall. This may satisfy the architects, but common passengers would rather violate architectural proprieties, and have round corners well cushioned.

Alterations are needed in the aisle end of the seats. The fashionable wood end is less comfortable than the old style of iron, and is inconvenient because it is open. The arm rests are hard, and the "nickel plated horse rasps" of some roads are a public nuisance. A plush surface is by far the most satisfactory.

The following average dimensions of passenger cars and seats will give the inventor some idea of the problem before him: The inside width varies from 9 feet 2 inches to 8 feet 5 inches above the truss plank, below, or within 11 or 12 inches of the floor; the car is usually from 2½ to 4 inches narrower. Seats are spaced from 26 to 36 inches between centers, and have from 11 to 18 inches in the clear at the level of the seat. The latter is a liberal figure. The back is from 36 to 37 inches

long, which leaves an aisle of about 24 inches, according to the width of the body of the car. The seat cushion is longer than the back to the extent of an inch or two. The cushion is from 17 to 20 inches wide, and stands from 17 to 19½ inches high. The backs come from 16 to 18 inches above the cushions, and are from 25 to 30 inches wide from top to bottom. The waste of covering material on some of the wider backs, on account of their projection below the cushions, amounts to as much as half a square yard. This may be averaged at from 12 to 15 yards per car. Seat arms are from 25 to 27½ or 28 inches from the floor.

The following are some of the points of a comfortable seat: It must be convex wherever it touches the person, as hollow curves are tiresome. The back should be convex, both horizontally and vertically, except where straight lines are used. The seat should be inclined, and there should be a good foot rest.

Parlor car chairs are even more objectionable. Nominally revolving, they interfere with each other, and are less comfortable than if fixed. They have most of the faults of the day coach seats. The promising field for the inventor is in the seat of the day coach, and certainly he who devises and introduces a seat meeting the requirements of the case ought to be well rewarded financially.

ASPECTS OF THE PLANETS FOR SEPTEMBER.

MERCURY

is morning star on and after the 2d. He wins the place of honor on the September record, for, though the most insignificant member of the sun's family, he is the most active of the brotherhood during the month.

On the 2d, at 1 o'clock in the afternoon, he is in inferior conjunction with the sun, passing between the earth's sun, as the moon does at new moon, and changing his role from evening to morning star. He is then on the western side of the sun, and, traveling at his most rapid pace, arrives on the 15th, at noonday, at his western elongation, the extreme limit of the invisible chain that binds him to the sun. He is 17° 52′ west of the sun, and at that time and for a week before and after may be picked up by keen-eyed observers, though the conditions are unfavorable. It is the last time during the year when he will be visible as morning star.

On the 15th Mercury rises nearly an hour and a half before the sun. He must be looked for about 7° north of the sunrise point, and about 7° south of Regulus. On the 27th, at 4 o'clock in the morning, Mercury is in conjunction with Jupiter, being 52′ north. This is the only planetary conjunction of the month. Both planets are moving westward, but Mercury overtakes and passes Jupiter on the way. The planets, near the time of conjunction, may be seen with the aid of an opera glass.

Mercury, on the 15th, is at his ascending node; on the 20th he is in perihelion; on the 30th he is at his greatest distance north of the sun's center.

The right ascension of Mercury on the 1st is 10 h. 46 m.; his declination is 3° 26′ north; his diameter is 10·4″; and he is in the constellation Leo.

Mercury sets on the 1st about 6 o'clock in the evening; on the 30th he rises at about a quarter before 5 o'clock.

SATURN

is morning star, and wins the second place for being at present the most beautiful of the stars, as Jupiter is for a time hidden in the sunlight, and Venus lingers too near the greater light that rules the day to be seen long after his disappearance. This wonder of the system takes no active part in the events of the month, but he looks serenely beautiful as, looming above the eastern horizon about midnight on the first part of the month, he slowly makes his way to the zenith, the leader of the surrounding myriad stars, reaching his culminating point just as he and his twinkling companions disappear in the light of the coming day.

The right ascension of Saturn on the 1st is 6 h. 27 m.; his declination is 22° 24′ north; his diameter is 16·6″; and he is in the constellation Gemini.

Saturn rises on the 1st at midnight; on the 30th he rises about a quarter after 10 o'clock in the evening.

VENUS

is evening star, and reigns supreme in the western sky, being the only visible planet after the sun goes down. She is still moving southward with rapid steps, thus decreasing the time of her stay above the horizon, and keeping her at about the same apparent distance from the sun throughout the month, though the distance between sun and star is constantly increasing as Venus proceeds on her eastward course. Southern observers will have delightful views of the fair evening star during September, and northern observers will have their turn for admiring the fascinating planet when, after pursuing her swift course to her extreme southern limit, she turns her steps northward, and adorns the northwest instead of the southwest portion of the sky. Venus sets during the month about an hour after the sun, but is now so bright on account of her nearer approach to the earth that her increase in size and brilliancy is plainly perceptible.

The fair evening star is in conjunction with Spica, or Alpha Virginis, early on the morning of the 10th, Venus being 2° 20′ north. Planet and star will be near together on the evening of the 9th, but a powerful glass will be required to obtain a glimpse of the star.

The right ascension of Venus on the 1st is 12 h. 42 m.; her declination is 3° 55′ south; her diameter is 12·6″; and she is in the constellation Virgo.

Venus sets on the 1st about half past 7 o'clock in the evening; on the 30th she sets about a quarter before 7 o'clock.

URANUS

is evening star until the 26th, and then morning star. On the 26th, at 2 o'clock in the morning, Uranus is in conjunction with the sun, passing beyond him and reappearing on his western side. Uranus is the last of the giant planets to reach conjunction, and after he passes the goal the giants of the system are all on the western side of the sun.

The right ascension of Uranus on the 1st is 12 h. 7 m.; his declination is 0° 4′ south; his diameter is 3·4″; and he is in the constellation Virgo.

Uranus sets on the 1st soon after 7 o'clock in the evening; on the 30th he rises about a quarter after 5 o'clock in the morning.

NEPTUNE

is morning star, and pursues his far-away course without encountering any other planet or large star, wandering just now in a region that is all his own. He is approaching his nearest point to the earth, and if he could change places with Mars, would create a great excitement in our sky.

The right ascension of Neptune on the 1st is 3 h. 34 m.; his declination is 17° 28′ north; his diameter is 2·6″; and he is in the constellation Taurus.

Neptune rises on the 1st at half past 9 o'clock in the evening; on the 30th he rises at half past 7 o'clock.

MARS

is morning star. He is now large enough to be visible, and his course may be easily traced by those who are sufficiently interested to rise for the purpose in the small hours of the morning. On the 1st he is seen in the constellation Gemini; on the 12th he is in line with Castor and Pollux; on the 24th he may be found in the cluster of stars in Cancer known as Praesepe.

The right ascension of Mars on the 1st is 7 h. 28 m.; his declination is 22° 39′ north; his diameter is 5″; and he may be found in the constellation Gemini.

Mars rises on the 1st about 1 o'clock in the morning; on the 30th he rises about half past 12 o'clock.

JUPITER

is evening star until the 8th, and then changes his role to that of morning star. On the 8th, at 5 o'clock in the afternoon, this brilliant planet is in conjunction with the sun, disappearing behind him, and being for a time totally lost to terrestrial view. He will, however, soon take his place among the visible morning stars, and afford new material for telescopic research. The latest observations point to a revival of the famous red spot, and seem to establish it as a permanent feature on the planet's surface. If so, telescopists will have a tangible point to build their theories upon, a wedge to effect an entrance beneath the cloud-atmosphere that envelops the pride of the system.

The right ascension of Jupiter on the 1st is 11 h. 25 m.; his declination is 6° 56′ north; his diameter is 29·2″; and he is in the constellation Virgo.

Jupiter sets on the 1st at half past 6 o'clock in the evening; on the 30th he rises at a quarter after 4 o'clock in the morning.

THE MOON.

The September moon fulls on the 24th, at 54 minutes after 2 o'clock in the morning. On the 3d, the day after the last quarter, at 9 h. 27 m. P.M., the moon is in conjunction with Saturn, being 4° 17′ south. On the 5th, at 1 h. 28 m. A.M., she is at her nearest point to Mars, being 5° 33′ south. On the 7th, at 10 h. 12 m. P.M., she is in close conjunction with Mercury, being 0° 37′ north. On the 8th, at 4 h. 55 m. P.M., the new moon when about an hour old is in conjuction with Jupiter, being 1° 57′ south. This event occurs a few minutes before the planet's conjunction with the sun. On the 9th, at 6 h. 34 m. P.M., the moon is in very close conjunction with Uranus, being 4′ south. On the 11th, at 5 h. 28 m. A.M., she is in conjuction with Venus, be- 2° 27′ north. On the 28th, at 3 h. 7 m. A.M., she is in conjunction with Neptune, being 2° 51′ south.

OCCULTATION OF ALDEBARAN.

An occultation of Aldebaran, or Alpha Tauri, occurs on the 29th that will be visible in Washington and its vicinity. We give the Washington mean time for the occurrence, which will vary in other places on account of the moon's parallax, or difference in her direction as seen from two different points. The immersion will take place at 1 h. 30 m. A.M., when the bright limb of the waning moon will suddenly hide from view the red star Aldebaran. The occultation will continue 1 h. 20 m., when the star will seem to spring into being from the dark side of the moon, the emersion taking place at 2 h. 50 m. A.M. Early risers will be rewarded for the effort, for this is all that is required to be present at the exhibition. The moon occults numerous small stars during the month, but the opportunity for beholding the occultation of a first magnitude star is rare. We assure observers that the heavens present a charming picture at half past 1 o'clock in the morning.

The moon also occults Aldebaran on the 9th, for those who see the moon in the same position as that from which she is seen at the center of the earth. She does more than to occult a star, for on the 7th she occults the planet Mercury. But observers in this vicinity are neither favored by position nor time to behold the spectacle when the slender crescent of the waning moon hides from view the smallest of the brotherhood.

TOTAL ECLIPSE OF THE SUN.

A total eclipse of the sun occurs on the 8th, though not a hair's breadth of his shining face is obscured to our view. The favored few who will behold the grandest phenomenon witnessed by mortal eye must be under the moon's dark shadow in the South Pacific Ocean. The path of totality commences near the eastern shore of Australia, passes over New Zealand, and ends near the South pole. It takes in its way Cook's Straits, which separate the two islands constituting New Zealand. The shores of the islands bordering on the straits seem to be the sole locality for observing the eclipse on land, the remainder of the path passing over a waste of water. A more ineligible locality could scarcely be chosen for the occurrence of the magnificent spectacle. But the moon's shadow is regulated by inexorable law, and those who wish to see the sun's face hidden for two precious minutes must go to New Zealand or sail on the Southern Pacific Ocean. An observing party from Melbourne plan to be present on the grand occasion, taking advantage of the comparative nearness to the scene of action.

ECLIPSE OF THE MOON.

A partial eclipse of the moon takes place on the 24th, visible on the Atlantic Ocean, in North and Sou h America, and on the Pacific Ocean. The eclipse will be easily observed in this region. It begins at 1 h. 15 m. A.M. The middle of the eclipse is reached at 2 h. 48 m. A.M. The eclipse ends at 4 h. 22 m. A.M. The magnitude of the eclipse is 0·79, the moon's diameter being 1.

SEPTEMBER

bears witness to an active and stirring season among the members of the solar family, wherein the sun himself plays a prominent part. Two great planets, Jupiter and Uranus, as they reach conjunction disappear from the sun's eastern side to reappear on his western. Mercury flits between the earth and sun at inferior conjunction, and oscillates to his extreme western limit or elongation, where early risers may behold him for a short time before his fitful light is quenched in the sunbeams. The sun reaches the vernal equinox, and equal day and night mark the passing hours, while he shines benignly over the earth from pole to pole. A favored few will behold a total eclipse of the sun's radiant face, and be filled with wonder and delight as the silvery corona starts into view and the rosy flames dart forth, while the stars appear in the darkened sky, and the face of nature is shrouded in funereal gloom. The moon is not behind the superior members of the family in the part she plays in the incidents of the month. She treats us to a partial eclipse and the occultation of a bright star. More than this, our fair satellite crowns the month with the harvest moon, when for several successive evenings the lesser orb rises in the eastern sky as soon as the sun disappears in the western, thus prolonging the day, flooding the earth with silvery light, and making it beautiful as a dream of the land where there is no night. There may be other planets combining more elements of natural beauty than this little world, when the sunset clouds linger in the west, and the harvest moon, rising majestically in the east, looks serenely down upon a belt of earthly domain ripe for the harvest. If such fairy abodes exist in the great universe of space, we have no desire to visit them unless we can be equipped for the voyage with higher powers than we now possess for the appreciation of the transcendent scene.

A New Wood Filler.

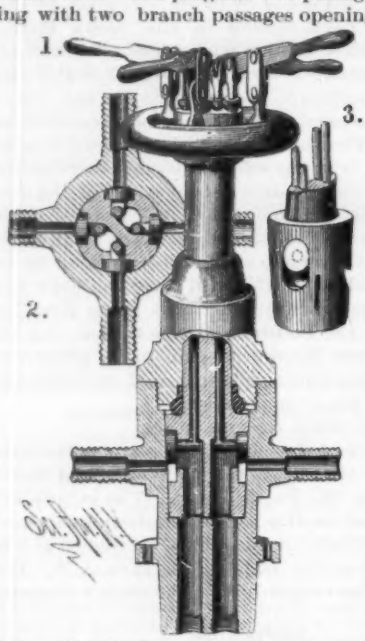
In order to avoid the necessity of using wood fillers of different composition for light and dark woods respectively, Mr. Henry Hales, of Ridgewood, N. J., has recently patented a composition of a transparent nature for use on all woods indifferently. It comprises finely powdered soapstone or talc, finely powdered glass, and a suitable liquid vehicle of oil or varnish, the soapstone enabling the operator to obtain a better polish than could be obtained with the glass alone. The patent points out the proportions and manner of mixing and applying the composition, which is intended to impart only sufficient color on light woods to fully develop the grain, while sufficiently transparent to leave no perceptible mark of its presence on dark woods.

A Big Blast.

A mass of granite estimated to weigh at least 500,000 tons was displaced recently on the line of the Iron Mountain Railroad, Missouri, by a single blast. A shaft 65 feet deep was sunk, with lateral chambers, in which 5 tons of powder were stored. After the shaft had been nearly filled to the top, an electric spark from a battery a half a mile distant fired the magazine with the result indicated.

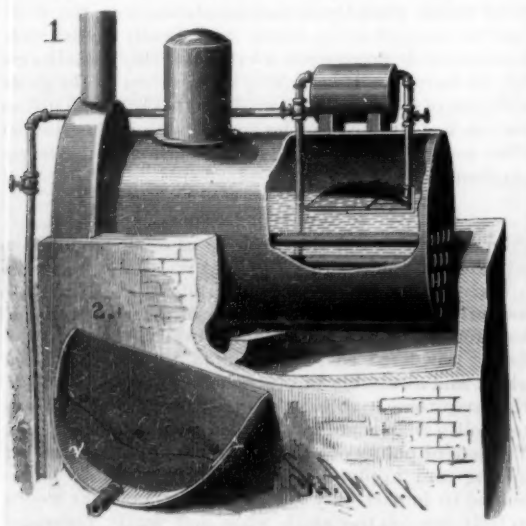
COMPOUND VALVE.

Fig. 1 is a sectional elevation, Fig. 2 is a tranverse section, and Fig. 3 is a side view of the plug detached, of a compound valve invented by Mr. George W. Appleby, of Cohoes, N. Y. The body is made in two parts for convenience of manufacture; the upper part carries and serves as a guide for the stem of the plug, and a packing ring inserted between the plug and the inner end of the upper part prevents escape of the liquid in that direction. The lower part is slightly tapered inside to form a seat for the plug, and is formed with separate inlet passages and with four outlet bibs. The plug has two passages, each connecting with two branch passages opening out at the side of the plug, as shown in Fig. 2. The side of the plug at the passages is countersunk, to form seats for slide valves carried by stems that pass through the plug stem and out at the end, where they are packed. On the hand wheel of the plug stem are posts carrying levers severally connected with the valve stems for use in moving the valves up and down. By opening either valve, the fluid is allowed to flow from one inlet to one outlet, and out at two bibs when the other valve at that side is raised. The same result can be obtained by moving the valves at the other side of the plug; thus both deliveries can be used at once. Either two of the bibs can be connected with either inlet by turning the plug on its seat. By this means two liquids can be delivered at once, or either alone. The valve is adapted for use on boilers for discharging either steam and water, or both, for heating apparatus, and for other similar purposes.



BOILER CLEANER.

The engraving represents an improved device for removing impurities from water in boilers to prevent the formation of scale. The skimmer is flat, and has an upwardly projecting flange on its rear rounded edge; it is shown detached in the lower part of the cut. On the bottom of the skimmer is a plate which also increases in width from its rear to its front edge, and has flanges forming continuations of the one on the main plate. According to the diameter of the boiler, a longer or wider extension plate is used, so that the ends of the front edge will be close to the sides of the boiler, to prevent the escape of any sediment. The lower end of a tube having a valve is held on the flange a short distance above the skimmer, the upper end of the tube being connected with the top of a settling drum on the boiler. At the opposite end of the drum is a pipe provided with a valve and leading back into the boiler. At the same end the drum is connected at its bottom with a blow-off pipe having a valve. The impurities in the water rise and float on the surface in a thin layer. The circulation carries these impurities over the skimmer, and with the water up through the pipe into the drum, where they settle. The clear water passes through the other pipe back into the boiler. At suitable intervals the settling drum is emptied through the blow-off pipe. This invention has been patented by Mr. Henry Estelle, of 544 First Avenue, Louisville, Ky.

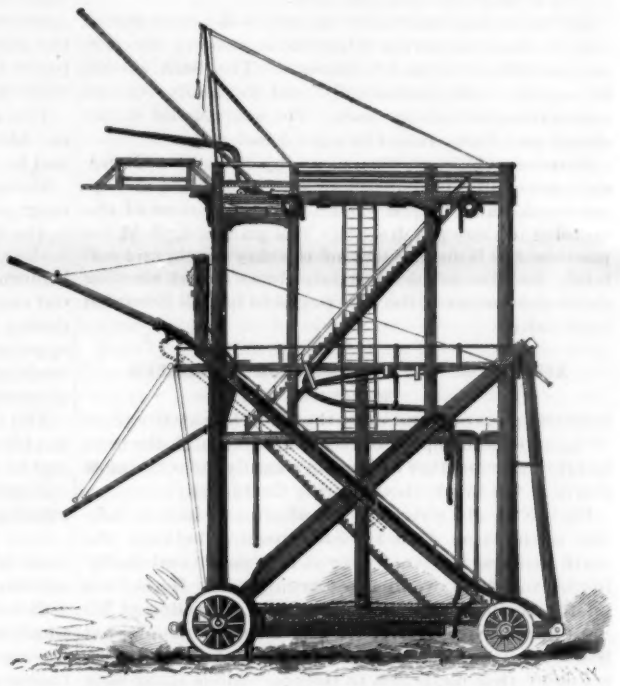


ESTELLE'S BOILER CLEANER.

HOSE TOWER AND FIRE ESCAPE.

By means of the apparatus shown in the accompanying engraving—recently patented by Mr. William M. Ward, of Harbor Grace, Newfoundland—a large volume of water may be thrown down from a height on the fire, instead of from the ground, thereby giving the firemen greater command. The apparatus can be erected to a considerable height, and can be connected with buildings to permit persons to descend. The base of the tower is formed of heavy side pieces uniting two axles; on the base are six uprights, two at each end and two at the middle, all securely and rigidly braced. Between each two end standards is a vertical screw spindle provided at the bottom with a pulley; around these two pulleys passes a heavy chain, so arranged as to turn both spindles the same way. In grooves in the inner sides of the corner standards move uprights of a vertically sliding frame; these uprights are united by a top and bottom platform. The heights of the frames are such that when the upper frame is lowered its top will be slightly above the top of the bottom frame. The screw spindles pass through nuts on the end pieces of the bottom platform of the sliding frame, so that by turning the screws the upper frame can be raised or lowered. A staircase extends from the rear of the bottom platform of the upper frame to the front part of the top platform. A staircase is hinged to the under side of the bottom platform of the sliding frame, and when the latter is raised the staircase is inclined upward from the front to rear. On the side of each diagonal, extending from the front upward to the rear, is a staircase, and single or double vertical ladders connect the top and bottom platforms of the upper frame. At the rear end of the top platform of the lower frame is formed a balcony, at one side of which a short tower is erected at the upper end of one staircase. On top of the tower is a windlass operated by a crank, and carrying a rope connected with the free end of a long nozzle on the end of a large hose extending up one diagonal brace. The hose and nozzle are united by a joint piece, so that the nozzle when not in use can be folded against the under side of the brace, as indicated by the dotted lines in the engraving.

By means of the windlass the nozzle can be raised or lowered. A hose extends along the brace on the other side of the frame and, is connected with a nozzle pivoted on a swivel standard, and which can be operated by aid of a properly arranged rope. A ladder on the end of the bottom platform of the upper frame can be held at any inclination by a rope; when not in use, the ladder is placed in a pocket formed on the under side of the bottom platform of the lower frame. Below the rear part of the top platform of the upper frame is a windlass, the rope of which is secured to the lower end of a ladder that can be raised through a trap door in the platform; this ladder can be held at any desired inclination. At the rear end of the top platform is a projection, and a bridge slides in suitable grooves; this bridge is long enough to extend from the frame to the windows of a house. On top of the apparatus is hinged a derrick pole, by means of which, and ropes, the sliding ladder can be brought into the desired position. Near this ladder is a swiveled nozzle on a hose leading to the ground. Additional hose tubes are placed on different parts of the frames, the lower ends extending to the ground, so that they can be easily coupled with engines or hydrants. The rear end of the frame is provided with rollers, so that it can be shifted laterally. It will be seen that the apparatus is so planned as to enable the firemen to throw water directly upon the fire from any desirable location, and provides a means of escape from windows in the upper stories.



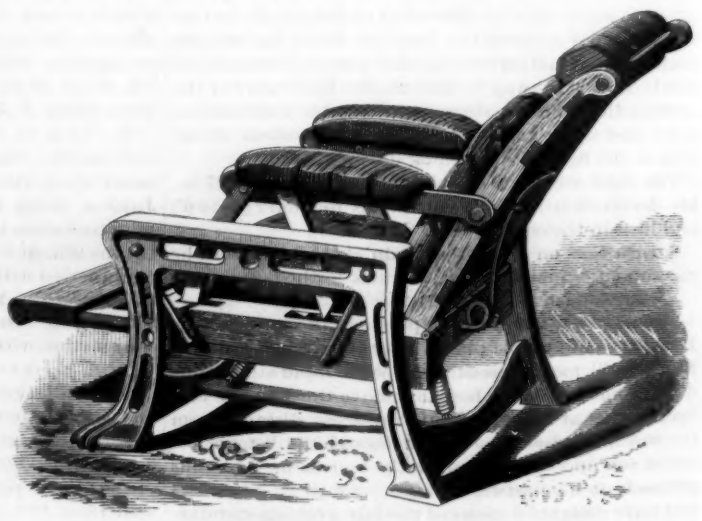
WARD'S HOSE TOWER AND FIRE ESCAPE.

THE SHOE BLACK PLANT.—The "Chinese shoe black plant," *Hibiscus rosasinensis*, is a native of India, China, and other parts of Asia. In its native countries it forms a tree twenty or thirty feet in height. In our climate, and in that of England, it is not hardy, and is cultivated simply as a greenhouse plant, for the sake of its beautiful flowers. These flowers contain a quantity of astringent juice, and, when bruised, rapidly turn black or deep purple. They are said to be used in Java for blacking shoes, whence the popular name. But the blackening properties of the flowers are probably overrated, judging from what we have learned from a gentleman who has seen the plant in its native country. The plant could probably be obtained from any American florist.

ROCKING CHAIR.

The rocking chair herewith illustrated, recently patented by Mr. N. G. Franzen, of Randolph, Kan., has a combined rocking and swinging motion, and may be used in sitting or recumbent positions. The side frames are so constructed and united, as clearly shown in the engraving, as to form a substantial frame, open clear through from front to back in the upper part to give room for the chair body. The body consists of a seat and back hinged together, and having arm bars pivoted to the back and to links pivoted within recesses formed in the upper edges of the side bars of the seat. A suitable spring secured to the end of the seat acts to swing the back forward on its hinge, and pawls hinged to the arm bars are adapited to enter notches in the upper edges of the seat bars, to lock the back firmly against backward pressure brought upon it by the occupant in swinging or rocking the chair. To support the chair body so it may rock or swing in the frame, U-shaped hangers are employed, the shanks of which incline toward each other at the same side of the chair, and are pivoted to the opposite side frames, the seat resting on the cross bars of the hangers: the bearings are so formed as to permit the cross bars to turn freely. The front and rear ends of the seat are connected to springs, the lower ends of which are secured to a tie plate, as shown.

These springs prevent the body from swinging too far either way, and as their normal tendency is to contract, they will always carry the seat to the middle position.



FRANZEN'S ROCKING CHAIR.

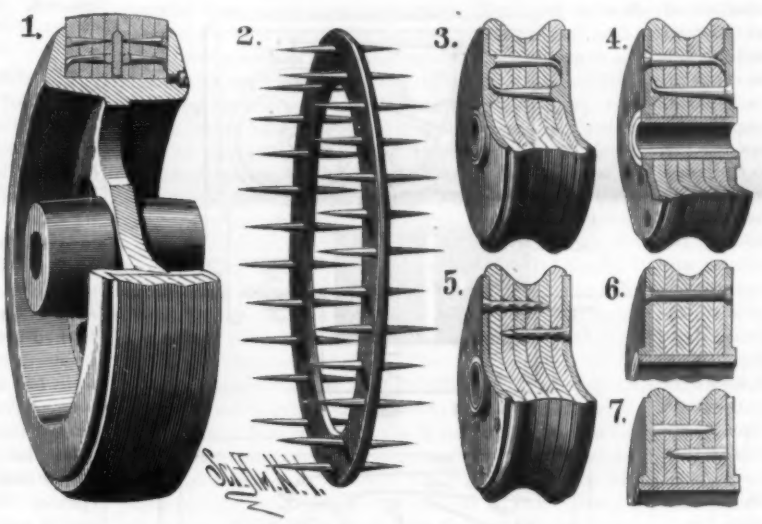
The opposite side bars of the seat have grooves formed in them, in which the side bars of the foot rest slide, so that it may be drawn out at any time, or be pushed in.

The occupant of the chair, by pressing against the back, can rock the body on the pivots and cross bars of the hanger, the front and rear springs giving the return motion in opposite directions. An easy and agreeable combined rocking and swinging movement is thus produced. By shifting the side pawls the slant of the back can be adjusted as desired.

IMPROVED WHEEL OR PULLEY.

The engraving represents a new wheel, invented by Mr. George P. Clark, of Windsor Locks, Conn., which is composed of a body of rubber, paper, leather, or other similar fibrous or compressible material, side plates of metal, penetrating points, and a central tube. The points are made, preferably, upon the inner surfaces of and integral with the plates, and of such length relative to the thickness of the body that when forced through the body they will be turned and clinched, as shown in Figs. 3 and 4. To cause the points to clinch properly, the plates are formed in most cases with triangular ribs upon their inner faces at the base of the points, so that the points of the opposite plate, after being pressed through the body, will come against one of the inclined surfaces of the ribs, and thus be deflected and made to clinch. In forming the wheel shown in Fig. 3, the sheets forming the body are placed upon a long tube; the plates are placed upon the same tube, when the whole is put in a vise and the plates forced toward each other. The points pass through the body from each side and clinch, thereby holding the material of the body in its solidly compressed condition. The long tube is then cut off close to the side plates, the wheel is put in a lathe, and the edge of the body turned true and to the required shape, according to the purpose for which the wheel is to be used. Instead of forming the points integral with the plates, headed nails may be driven through countersunk openings in the plate and into the body, the nails being long enough to pass through and clinch as shown in Fig. 4. Barbed nails, Fig. 5, may be employed, the spurs on the nails serving to bind the parts of the body together and to securely hold the plates in place. Rivets, as shown in Fig. 6, driven through the plates and body and headed at both ends, may be used instead of the clinching nails; and in some cases the body may be held together by pegs, the plates then being plain and held in position by upsetting the ends of the central tube, as shown in Fig. 7. In making large wheels, the inventor uses a malleable iron spider cast with a flange upon only one side of the circumference; this flange takes the place of one plate, a separate annular ring holding the body, or tire, of compressed material. The penetrating points can be formed as a part of the flange and ring. The tire is made of sheets cut in annular form, and placed upon the plain circumferential surface of the spider, and then compressed between the flange and ring, the latter being held by screws. When necessary to make this form of wheel very strong, an annular plate, Fig. 2, is employed, which is formed upon each side with penetrating points.

Wheels constructed in the manner above described possess many advantages over those made of wood; they are free from all danger of chipping, will not wear off on the edges, and run easily and smoothly. The materials forming the body, being forced together under great pressure, insure the durability of the wheel. These wheels are practical for various purposes, and are particularly adapted for use in skates.



CLARK'S IMPROVED WHEEL OR PULLEY.

THE number of sheep in Saxony has fallen from 371,989 in 1861, to 149,037 in 1883. In Germany the reduction was 33 per cent. between 1873 and 1883.

Electric Signaling Balloons.

The idea has been worked out by Mr. Eric Stuart Bruce, son of the late General Michael Bruce, and is exhibited in operation every evening for the present at the Albert Palace, Battersea Park. About 9 o'clock a balloon 20 feet in diameter, and containing some 4,000 cubic feet of gas, is allowed to ascend to a height of 500 feet, and is rendered visible by six incandescent lamps of 20 candle power fed from a battery on the ground. The material of the balloon is translucent cambric, and when the lamps are in action the whole glows with a soft light which is very noticeable, and in a clear atmosphere can be seen for miles. In the conductors from the batteries to the balloon there is inserted a Morse key, by which the circuit can be made and broken, and the lamps be caused to give long and short flashes corresponding to the dash and dot of the telegraph code.

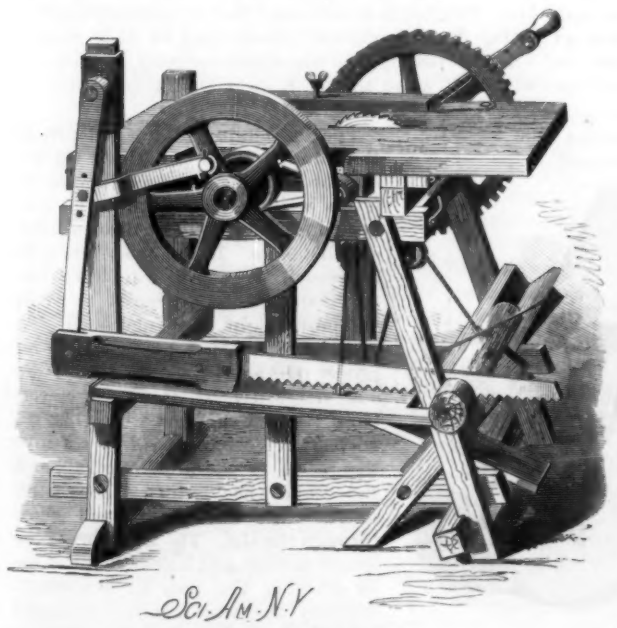
It can be used in a flat country, or between valleys separated by low hills, instead of being confined to elevated positions like the heliograph; the balloon also shows a large illuminated disk in place of the small mirror, and can be packed together with its batteries in little compass for transport.

A HAND POWER SAWING MACHINE.

The accompanying illustration shows a machine which can be used for sawing stove wood, ripping lumber, and other such work, and is operated by a crank handle and treadle. The teeth of the gear wheel, which is rotated by turning the crank handle, mesh into a small gear wheel, which is not shown, but which is attached to the other end of the shaft, on which is the flywheel. A crankpin and arm connect the latter with a vertical swinging bar, at the lower end of which is an arm to which is attached a saw. The vertical swinging bar has several holes to receive the pivoting pin, and thus regulate the throw of the saw, while the arm carrying the latter is made sufficiently heavy to hold it down to its work. The stick of wood to be sawed rests in a triangular trough at the front of the frame, and under the saw is hinged a board, in such position that, when the stick is sawed through, the arm carrying the saw will slide upon this board, and hold the saw teeth out of contact therewith should the motion of the machine be continued. The forward end of this board is also so connected with the treadle that the saw arm and saw can be lifted, by pressing upon the treadle, to be out of the way while the stick is moved forward for an additional cut or replaced by another. The stick is held down while being sawed, by a spring, which is also so connected as to be operated by the treadle to release the stick.

For working the circular saw there is a pulley on the shaft which carries the flywheel, connected by belt with a small pulley attached to the mandrel carrying the saw. The bearings of the latter are on the lower side of the table, through a slot in which the saw projects. This table is hinged at its rear end to the rear top bar of the frame, so that when the belt to operate the circular saw is thrown off, the table, saw, and saw mandrel can be turned back out of the way, or may be readily detached entirely from the frame. The crosscut saw can likewise be readily disconnected from its driving mechanism, so that either saw can be used separately, or both may be used together, as may be desired.

This invention has been patented by Mr. Robert Gurney, of Kirkwood, Mo., to whom all inquiries for further particulars should be addressed.



GURNEY'S DRAG SAW.

Second Hand Machinery.

There is no particular risk in buying second hand machinery and shop appliances, if such ordinary caution is used as would be deemed necessary in buying second hand furniture. If the seller is a man of known integrity, and is practical mechanic enough to understand not merely the market price, but the actual value of the machines, it is enough to trust to his representations. But it is not often that the practical or judging mechanic and the honest dealer are combined. Auction sales of machinery may be traps, unless the would-be purchaser has had previous opportunity to examine the goods. Second hand machinery is frequently offered for sale, not only cleaned of gurry and rust, but painted, varnished, and polished. "Paint and putty cover a multitude of mechanical sins."

The times have put upon the market a large amount of machinery that has been used, much of it used up and fit only for the scrap heap. But the business necessities of some proprietors of small establishments have impelled the selling of shop tools and appliances at very low prices. There are plenty of good second hand tools in the market, as well as plenty of junk material.

If the purchaser is not himself a practical judge of the value of a machine, or a shop or factory appliance, it is not difficult to obtain, for a moderate consideration, the examination and opinion of a good mechanic. This will pay, even if the examiner makes a fair charge for time and trouble.

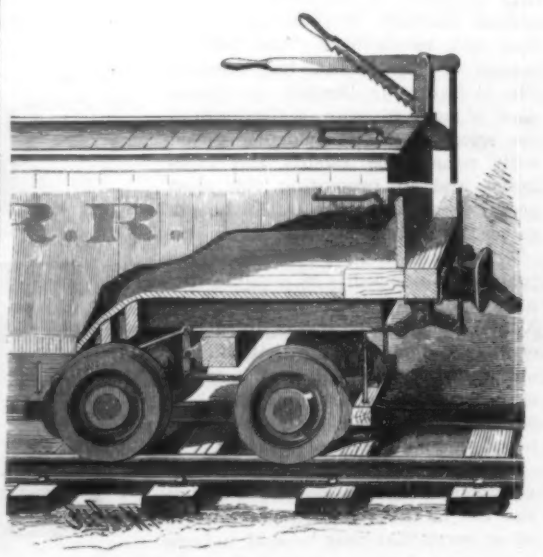
A small manufacturer wanted an additional boiler, and he bought a second hand one that had been coal tarred inside and out; it looked clean and shone beautifully. He bought it "dirt cheap," and had it put in place. It leaked like a sieve as soon as sixty pounds pressure was on; he had it calked on the seams, poured in a lot of rye flour; had the coal tar foaming over into his engine cylinder, and after three weeks of torment blew it off and had a reasonable boiler-maker examine it.

The result was patches and repairs to almost the first price paid; the combined expense would have bought a good boiler, and a small outlay for experience would have saved him a vexatious outlay of money and patience.

A CAR BRAKE.

A new method of operating a car brake from the top of car is shown in the accompanying illustration. Bars carrying the brake shoes are suspended from the bottom of the car, and a lever pivoted on the middle truck beam is connected by rods with the front and rear brake bars; the upper end of this lever is connected by a rod with one arm of an elbow lever pivoted at its angle to lugs held on the under side of the end beam of the car, and the other or outer arm of the elbow lever is connected by a rod with a hand lever pivoted on a standard on the roof of the car at the end. By pressing down this hand lever, the elbow lever and the lever on the middle truck beam are operated to press the brake shoes against the wheels at both front and rear simultaneously, the toothed bar pivoted to the standard engaging with a pin on the hand lever to hold the brake locked in position.

This invention has been patented by Mr. Joseph M. T. Daudelin, of Jefferson, Texas.



DAUDELIN'S CAR BRAKE

THE AUTOGRAPHIC TELEGRAPH.

(*Continued from first page*).

turns the wheel so as to bring the plates back to their former position. This is repeated again and again as fast as the power of the current and arrangement of the parts will allow.

On the underside of the bed, A, is a switch, operated by the handle shown in Fig. 2, which throws the currents of the several circuits used into either the transmitting or receiving side. Each machine is provided with wires leading to the switches from the binding posts, where the line and battery wires enter, so arranged that the currents will only be closed through the line and local circuits when the transmitting side in one machine and the receiving side in the other are thrown in by their respective switches. A separate wire is used for the transmission and recording of messages. The current from the battery enters the machine, and is carried through the switch to the insulated arm, L, then through the stylus to the transmitting strip, then to the brush and to the second line wire. At the receiving machine it is directed by the switch to the arm (in Figs. 1 and 2 the receiving and transmitting sides are reversed), then through the stylus and receiving paper to the guide, Q', and to the ground. Where the stylus on the transmitting strips encounters only the tinned surface, the current passes through a local circuit, that presenting the lesser resistance; but where it meets the ink the local circuit is broken, and the current passes over the line to the other instrument, that being the only route it can then take.

The strip having the characters written upon it is placed on the transmitting side, and the cam lever, *o*, is moved to bring the friction roller down on the strip and close the circuits through that side; at the distant machine this operation is reversed. The pole changer begins to work, actuating the magnets, E, of one machine and E' of the other at the same instant, so as to cause the armatures to vibrate together. The arms, L L', are vibrated over the surface of their respective strips. The springs, J and J', alternately energize the feed magnets, U U', thereby keeping the pole changer in operation and driving the feed mechanism, so that the paper in each machine is fed forward one step at each vibration. When the transmitting slip has passed through, the handle of the lever is moved to the other side, when the instrument is in readiness to receive a message from the other end of the line.

When not in use, both machines are so set, by properly shifting the switch lever, that an entering current will pass through the receiving side; therefore, when it is desired to send a message from either end of the line, all that is necessary is to shift the switch so that the current will pass through the transmitting side of the sending instrument. Upon shifting the switch to throw the current through the receiving side of the instrument that had been used to transmit, upon the completion of the message the circuits are all broken, and either instrument is in readiness to be used either as a receiver or transmitter. Consequently the instruments require no attention whatever except when transmitting, and then only the sending one.

Having thus described the mechanical parts of the invention, we will add that we have witnessed its practical operation at the office of the company with the deepest interest. It promises greatly to modify, if it does not revolutionize, the present modes of telegraphic transmission. The inventor, Mr. Denison, is a young man of only 24 years, self-taught in the sciences. He is evidently gifted with remarkable talents and ingenuity, and in presenting this most useful discovery to the public he deserves the highest honors.

The New York Auto-Telegraph Company will, as speedily as possible, furnish facilities for intercommunication between any desired points, by means of wires and instruments that will enable the users to send facsimile copies of written messages from place to place in substantially the same manner as telephonic messages are now sent.

It is not supposed that the new invention will take the place of or curtail the use of the telephone, but it will fill a want that may be said to have been created by the use of the telephone, and enable people to send written messages in relation to their business operations in the same manner and with the same facility that they now send verbal ones. The advantage is evident, in that it leaves a record of the business transacted and avoids all mistakes of memory or misunderstanding.

The almost instant autographic communication between the presidents or cashiers of banks in every part of the city, with each other, or with the Clearing House, that is made possible by these instruments will be of very great advantage in the conduct of their affairs. And in every other kind of business where the instantaneous transmission of exact communications in written characters to distant points, instead of employing the slow medium of the mails or messengers, or the telephone which leaves no record of what is sent, is of importance, the use of the machines will be of the greatest value.

It is impossible to enumerate the uses to which a teleautograph machine of this character can be adapted or found valuable. The machine itself in its general appearance is not unlike a stock indicator, or "ticker,"

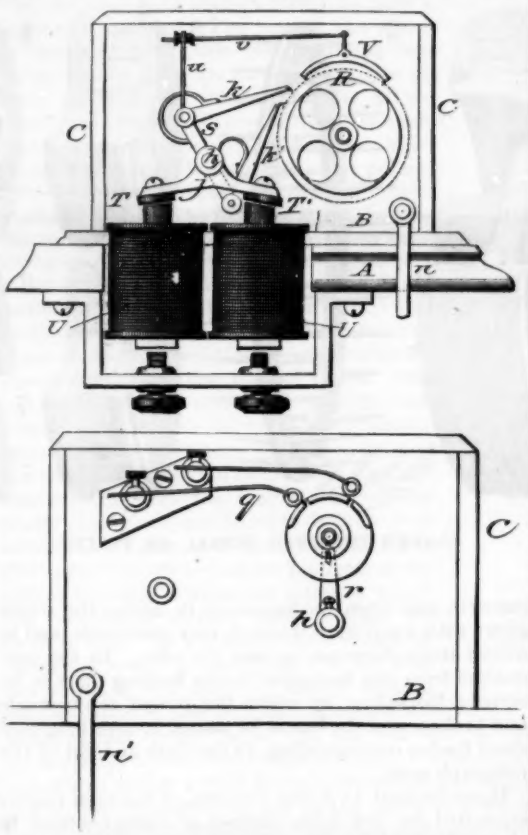


Fig. 3.—POLE CHANGER AND FEED MECHANISM.

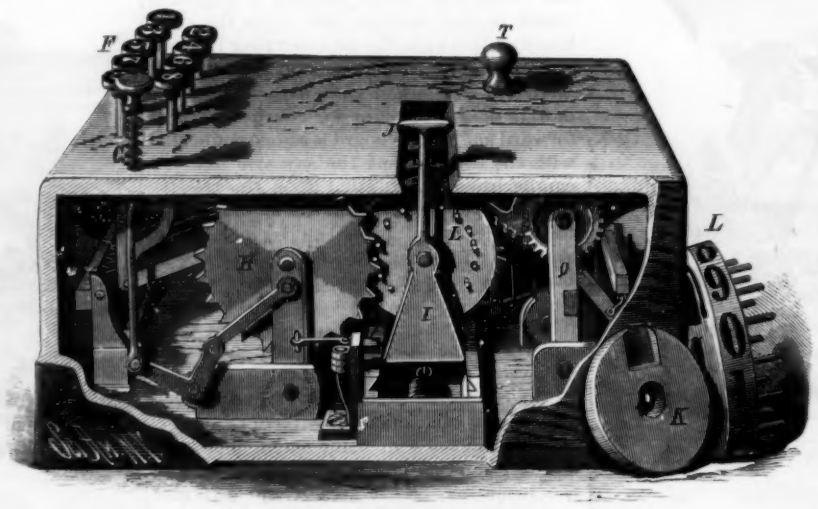
used in brokers' offices. The messages are written and received on continuous strips of paper, the roll of receiving paper being suspended beneath instead of above the machine, as in the "ticker." The roll of transmitting paper stands on the desk of the user, where he can write messages at his convenience, and at any length he desires.

The transmitting paper is a common thin paper, tinned or bronzed on one side, such as is sold in the market in great rolls for use in ornamenting the corners of paper boxes and other cheap articles. The ink used is common ink, with a little silicate of soda or potash added. When the message is written, it is torn off from the roll and taken to the machine, where one end is placed in the transmitting side. By lifting for a moment a small spring latch, which grips the end, and then by moving a small lever, the instrument is set in operation. No clockwork weights or springs are used in producing the motion or operation of the various parts, only a simple arrangement of electro and permanent magnets, operated entirely by the current on the line, and a local battery contained in a box, which forms the pedestal on which the instrument stands. Any child can insert the message and start the machine. The message may be sent backward or forward, and be written in English, German, Chinese, shorthand, or any other characters.

The machines are so arranged that when a wire circuit is established between any two of them, with a light battery, both machines are started in motion at once by the lever of the transmitting instrument; and as the written message passes through its machine (as it does in a manner very like the tape in an ordinary "ticker"), a strip of receiving paper passes through the receiving instrument, on its receiving side, and an exact facsimile copy of the characters on the written message is produced on the white receiving strip. As each instrument has a transmitting and receiving side, it can be used alternately to transmit and receive as desired.

ADDING MACHINE.

The entire mechanism is contained in a box on the bottom of which are pivoted two standards, having a shaft journaled in their upper ends. On the shaft are rigidly mounted nine ratchet wheels, adjoining each of which is a lever mounted to rock on the shaft, and having a pawl pressed by a spring against the teeth of its wheel. Each lever is connected by a wire with an arm pivoted on a standard, and pressed upward by a spring. The wires and arms are of different lengths, so that from the same vertical throw of the different arms the ratchet wheels connected therewith will be turned different distances. Rods or push pins project upward through the top of the box, and are provided with heads, F, arranged in two rows, the even numbers being in one row, and the odd numbers in the other. One of the pivoted standards is connected by a rod and elbow lever with a push pin, G, having a head at its upper end; this push pin is pressed upward by a spiral spring. The wheel, H, is rigidly mounted on the shaft, and is provided on its rim with triangular teeth. Two standards, I, united by a bottom plate, slide transversely on a support in the bottom of the box, and carry a shaft on which hubs, K, are rigidly mounted. Adjoining each hub is a loosely mounted wheel, L, having a circular row of ten pins projecting over the hub corresponding to the wheel, and between these are nine shorter pins arranged so that a blank space will be left between two of the longer pins. On that surface of each wheel, L, opposite the one from which the pins project is pivoted a pawl, the free end of which is connected with a spring throwing the outer end of the pawl outward, so that when it comes opposite the recess in the hub, K, it can enter the recess and engage with the long pins of the next wheel. From one of the standards, I, an arm, J, projects upward through a transverse slot in the top of the box. On the rim of each wheel are the numbers 1 to 0 inclusive. A pawl pivoted on a standard, and pressing against a rack formed on the front edge of the plate uniting the standards, I, is connected by a wire with the pivoted standard. In the rear of the box are two standards, Q, pivoted to swing in a vertical plane, and united by a cross piece and a shaft journaled in the top. On the shaft are mounted as many cog-wheels as there are wheels, L, the cog-wheels passing in between the wheels, L, and engaging with the long and short pins. On one end of this shaft is a pinion engaging with a gear pivoted on one of the standards, Q, and an arm, this gear being connected by a fixed cam with a pinion. Sliding vertically in a standard is a bar, T, projecting through the top of the box. This bar is so connected that by properly manipulating it the numbered wheels may be made to show 0 in the opening; the cog-wheels refusing to move the wheels, L, when the teeth meet the vacant space between the pins.



MACNIDER'S ADDING MACHINE.

The push pins, F, are all depressed the same distance, and throw the levers through the same arc; and as the levers vary in length, the arms connected therewith will be thrown different distances. If the push pin, 2, be depressed, its wheel will move two teeth, and if 8 be depressed, its wheel will move eight teeth, and so on. To add the numbers 2, 1, 5, and 3, the proper pins are depressed successively, and the wheel, H, is moved eleven teeth. When the first wheel has revolved ten teeth, its pawl passes into the recess in the adjoining hub, and the second wheel is turned one space, so that the number 11 will show through the slot. The first wheel is no longer needed, and is shifted out of use by pushing the rod, G, downward, whereby the wheel, H, is disengaged from the first wheel, L, and a spring is allowed to pull the carriage carrying the standards, I, one tooth on the rack, when the wheel, H, will engage with the second wheel, L. The second column is added, and then the wheels are shifted again.

This invention was patented by the late Mr. Wm. J. Macnider; particulars can be obtained from Mr. Q. Macnider, of Greensborough, Georgia.

MR. GREENFELL'S explorations on the Mobangi prove it to be the greatest tributary to the Congo, and navigable for 400 to 450 miles.

Correspondence.

The "Longest" Bicycle Ride.

To the Editor of the Scientific American:

Your article, "Two Thousand Miles on a Bicycle," in issue of August 1, gives Mr. Goodwin credit for the longest bicycle ride on record. Mr. Thos. Stevens, an Englishman, with a 50 inch Columbia, rode from Oakland, Cal., to Boston, Mass., 3,700 miles, in 103½ days, completing the trip August 4, 1884. *Outing*, the Boston publication, has made arrangements with the plucky rider to continue the trip around the world. Mr. Stevens left Liverpool May 2 on his ride across Europe and Asia, and on May 26 had arrived at Munich, Bavaria. He will remain at Constantinople until September 1, then complete tour soon as possible. The route will probably be through Syria, Persia, Afghanistan, Northern India, Upper Burmah, China, through Japan, and thence to San Francisco.

LON H. HUTCHISON.

Huntington, W. Va., Aug. 2, 1885.

Dynamic Momentum.

To the Editor of the Scientific American:

In answer to the exceptions taken by Mr. W. D. Evans to my article on Mechanical and Steam Engineering, I would say that Mr. Evans' figures are all correct, except the units of heat required to evaporate one pound of water into steam, which probably is a misprint; it should be 1,178 units, instead of 11,781 units. Mr. Evans should have carried his investigation a little further. The 108·2 units of heat contained in a pound of water above the boiling point, multiplied by the pounds of water the boiler contains, is the dynamical momentum, or value of force of explosion.

One cubic foot of water at ninety pounds steam pressure weighs about 58 pounds; this multiplied by 108·2 equals 6,275 units of heat; this multiplied by 772 foot pounds, equal to one unit of heat, is 4,844,300 foot pounds, contained in one cubic foot of water at the aforesaid pressure, dynamically equal to nearly two pounds of gunpowder.

I wish to say with Professor Tyndall that "my greatest desire is to know the truth, my greatest fear that I would believe a falsehood." I would not wish to exaggerate or mystify, or cause any relaxation of watchfulness on the part of the engineer in charge of a steam boiler. I would refer Mr. Evans to the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 289, 313, and 341, also to Thomas Box on Heat, all of which can be obtained of Messrs. Munn & Co.

J. K. WILLIAMSON.

Seattle, W. T., Aug. 7, 1885.

Balata.

In the *Journal of the Society of Arts* for November 20, 1863, a list of subjects for premiums was published, among which was one "For any new substance or compound which may be employed as a substitute for India-rubber or gutta-percha in the arts and manufactures."* This was responded to in the *Journal* for February 26 and March 4, 1864, a letter being published in the latter from Sir William Holmes, from British Guiana, advising the dispatch to the Society of a box containing samples of balata, both in the fluid or milky as well as in the dried or coagulated state. In the letter referred to, Sir William Holmes speaks of the small specimen which was exhibited in the International Exhibition of 1862, as attracting a considerable amount of attention, and further says, so far as he could judge, balata was not to be rivaled either by India-rubber or gutta-percha, possessing "much of the elasticity of the one and the ductility of the other, without the intractibility of India-rubber or the brittleness or friability of gutta-percha." Sir William Holmes further expressed a hope that balata would, ere long, be included as an important item among the exports of the colony. Notwithstanding that this was written so far back as 1864, little or nothing has been done since toward making balata a regular article of import; occasional notice has been drawn to it from time to time, and the subject as frequently allowed to drop. As a proof of the truth of Sir William Holmes' statement as to the ductility of balata, it may be mentioned that a sample of that exhibited in the Exhibition of 1862, and presented to the Kew Museum at the close of the Exhibition, is still in a fairly ductile state, and shows no such brittleness as is the case with gutta-percha.

In connection with this subject of the development of balata, Mr. G. S. Jenman, Government Botanist, and Superintendent of the Botanical Gardens in British Guiana, has just drawn up a very exhaustive report, the result of which, it is hoped, will be to bring the substance into a regular commercial channel.

The title of the report is "Balata and the Balata Industry, Forest Laws," etc., and it commences with a very interesting description of the bullet tree region, including its inhabitants, character of the vegetation, etc. Coming to the immediate subject of the report, Mr. Jenman describes the bullet tree, from the bark of which balata is obtained, as a large forest tree ranging from Jamaica and Trinidad to Venezuela and Guiana. He refers it to *Mimusops balata*, and says: "The vernacular name appears to be applied to two species or sub-species which are united by Grisebach, in his 'Flora of the British West Indies.' Young plants of *Mimusops globosa*, of Jamaica and Trinidad, growing in the Gardens, seem to be distinct from the Guiana type. The tree grows to a height of 120 feet, and has a large, spreading head. The trunk is nearly cylindrical. The bark is about half an inch thick, with deep parallel fissures an inch or so apart. The hard, reddish-colored wood is one of the densest in the colony, and is used for all sorts of purposes where great strength and durability are required. The tree is more plentiful in both the eastern and western part of this colony than in the intermediate region. From the east bank of the Berbice River to the Corentyn is the region of its greatest plentifulness in the colony, but its distribution extends still eastward beyond the Corentyn into Dutch Guiana, where a grant of several hundred thousand acres has recently been acquired by an American firm for collecting balata. The trees are more plentiful in this region in the depths of the forest than near the rivers, hence the creeks form arteries to the balata grounds. Several of the creeks on both sides of the Canje are instances of this. The wood cutters of this district regard the tree as inexhaustible; in the interior of the forest it exists in profusion and abundance, and lies beyond the reach of the balata collectors as they at present conduct their operations. As the trees near at hand become exhausted, they will no doubt alter their habits, and make clearings as drying places in the heart of the forest; but now they are under the obligation of returning to the settlements on the creeks with the milk they have collected to dry. Under this necessity, they can at most only penetrate about two days' journey, but, so far as they have explored, they report there is no diminution in the abundance of the trees. The forest at this depth, of course, has never been touched by woodcutters, as, for convenience in getting their timber out, they have to confine their operations to the banks of the river and creeks, rarely going in more than a mile or two." Regarding the character and value of balata, Mr. Jenman says its strength is very great; and as it does not stretch under tension, for special appliances, such as bands for machinery, it is unequaled. It has recently been pronounced by an American firm of manufacturers as "the best gum in the world."

Dr. Hugo Muller, F.R.S., in a report on the substance says: "It seems that balata is by no means neglected, and in fact it would find ready purchasers if more of it came to the market; as it is, the supply is very limited, and generally it comes only once a year. It commands a higher price than gutta-percha, and this in itself is a proof of its usefulness. It is used almost in all cases in which gutta-percha is used, but, on account of its higher price, only for superior purposes. It seems that balata is treated by the manufacturers simply as a superior kind of gutta-percha, and, therefore, its name disappears when manufactured. Nevertheless, balata is distinctly different from gutta-percha, and this is especially manifested in some of its physical characters; for instance, it is somewhat softer at ordinary temperatures, and not so rigid in the cold.

"In one respect balata shows a very marked and important difference from gutta-percha, and that is its behavior under the influence of the atmosphere; while gutta-percha, when exposed to light and air, soon becomes altered on the surface, and changed into a brittle resinous substance, into which the whole of the mass is gradually converted in the course of time, balata, on the other hand, is but slowly acted upon under these circumstances. The electrical insulating quality of balata is said to be quite equal to that of gutta-percha."

Mr. Jenman says that the collecting of balata is an open and recognized business, is carried on only in Berbice, but he proceeds to show that the greater part of that so collected is not obtained from trees on government grants, but surreptitiously from crown lands; and Mr. Jenman further says that much damage is done to the crown lands by the depredations of collectors, and "that it is desirable, in the interest of the colony, till effective rules are devised for the protection of the forest and the preservation of this valuable wood, that the trade should be discontinued."

The life of the balata collectors is a very hard one. The ground they have to traverse is generally very wet and swampy. In many cases the traveler sinks at every step up to his knees, and this continues for miles, and water often has to be waded through up to the armpits. When the collecting ground is not too far distant, women sometimes accompany the men, and cook or assist in laying out the calabashes, and collecting the milk, while the men fell and ring the trees. The collectors connected with a grant sell the milk they collect to the agent on the grant, and never dry it themselves. The price for pure milk is four shillings per gallon, or occasionally a dollar, and for clean, well dried balata, one shilling per pound. Considering the circumstances of the people who follow it, balata collecting, if pursued with industry, is a paying business. The calling pays better, while the season lasts, than the best mechanical trade; with fair weather, a man can earn from one to five dollars a day at it, and an exceptionally expert collector has been known to make twenty dollars in three days.

The instruments used in collecting the milk are an ax for felling the trees, a cutlass for making the channels in the bark to cause the milk to flow, and two or three gourds in which to collect the milk. The collector commences operations by chipping a piece of the bark from the selected tree, and if the milk runs well, he quickly shaves the moss and rough bark from the side he intends to tap, then, stooping down with his back to the front of the tree, but on one side of it, he cuts from the base of the tree obliquely upward toward himself, in the bark, a narrow channel, then moving round the other side, a similar one. These grooves are generally about eighteen inches long; they form an acute angle at the base, just below which a niche is cut in the bark and is slightly lifted with the end of the cutlass, and a calabash inserted by the rim under it. Occasionally a piece of palm or maranta leaf is inserted under the bark, and the calabash is placed on the ground, the leaf conducting the milk into it. The channels are then quickly cut upward parallel to each other on the opposite sides, about ten inches apart, the operator continuing them as far as he can reach, which is about eight feet from the ground. The milk trickles from cut to cut down this zigzag line into the calabash beneath. The best collectors cut the bark with much neatness and precision, and do not injure the trees; but little care is usually taken, and the wood is injured with every stroke of the cutlass, the result being that numerous trees are killed, and left standing. Large trees are always tapped on the opposite sides, careful collectors leaving the intervening spaces for subsequent years. It takes from five to ten minutes to cut the channels in each tree, and the milk runs from forty to sixty minutes; at first it forms a little rivulet, but after about twenty or thirty minutes, it only drips. After a little use, the gourds become so coated on the inside with dry balata that they have to be occasionally soaked in water, when it peels off freely, leaving them perfectly clean again. The yield of a tree varies according to circumstances. If favorable, a tree fifteen inches to twenty inches in diameter, bled eight feet high, will yield three pints of milk. Trees are often felled, and then tapped by ringing the bark in parallel transverse lines, at intervals about a foot apart.

To dry the milk, it is poured into shallow wooden trays, the insides of which are previously rubbed over with oil, soap, or grease, to prevent the balata sticking, and the substance is exposed to as much air as possible, and sometimes to the sun. In fine weather it takes two or three days to dry, and in wet weather a week or more; when it is sufficiently dry to be removed from the boxes, the sheet is thrown over a line or bar, to drip, and become hard.

A good deal of foreign matter is found in the milk, and Mr. Jenman says adulteration is systematically carried on, and the agents have at all times to be on their guard against it.

The report concludes with a consideration of the damage done to the forests, and some remarks on their better conservation.

* In a paper on "Gutta-percha in Surinam," Professor Blockrode described balata as the product of a tree named by him *Sapota Mulleri*.—*Journal*, vol. v., p. 625, Oct. 9, 1857. See also vol. viii., p. 713, and vol. xxxii., p. 14.

Forcite Powder.

Among the explosives now in the American market is forcite powder, which is rapidly winning a name for itself among the older powders, and is battling for popular recognition in its claims for a front rank in efficiency and economy.

This new powder is very similar to explosive gelatine, the most powerful agent known among the explosives; it was invented by K. J. Sundstrom, a Swede, and patented in this country in 1881. It is a pasty or plastic gelatinized nitro-glycerine compound, and is composed of cellulose and niter and nitro-glycerine.

Its advantages as an explosive are stated as follows: It is five times *less* sensitive to shock than dynamite, and is that much safer; its semi-solid state permits it to be used with ease under any and all conditions; like explosive gelative, it is impervious to water, and is thus valuable for military, naval, and submarine work; it is claimed to be, on the basis of volume, 25 to 50 per cent stronger than dynamite, and its cost of manufacture is about the same as dynamite.

In support of these claims for the new powder we notice, says *Engineering News*, that Gen. Henry L. Abbot, in an official report upon the test of this powder, says that taking dynamite No. 1 as a standard, and giving it a value of 100, the forcite, with 95 per cent equals an intensity of 133; with 75 per cent, it equals 124; and with 40 per cent strength it equals an intensity of 95. In a personal letter to the manufacturers of the forcite, published with the report, Gen. Abbot also says: "Your explosive is the strongest to be had in our market, and must therefore be a prominent candidate for adoption in our torpedo service in place of dynamite No. 1."

BURYING TELEPHONE WIRES IN THE SEWERS OF PARIS.

The question of burying the telephone, telegraph, and electric light wires, instead of having them strung on poles as heretofore, is now attracting a good deal of attention in all our large cities. In New York, where the inconvenience of the overhead wires is probably felt most seriously, there is now sitting a commission, authorized by the Legislature, to determine upon some general system for placing the wires underground, and then see that this is done. The work of this commission thus far has been simply preliminary, consisting of the receiving of various plans and devices for effecting the desired end, of which a large number has been

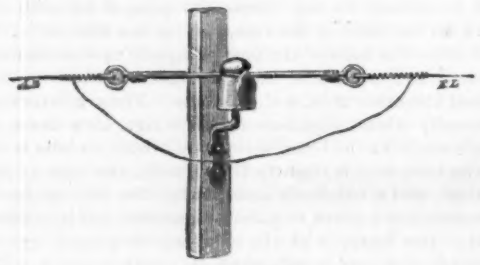


Fig. 1.

submitted. The opposition by the companies, which at first seemed to be mainly on account of the additional expense that would be imposed on them, seems now to be more particularly directed to the alleged impracticability of any of the plans proposed, on which it is the duty of the commission to decide.

How this difficulty is overcome in the French capital

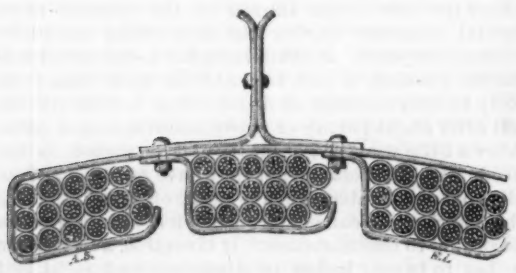


Fig. 2.

will be readily understood from the accompanying illustrations, the admirable sewerage system of Paris affording the ready means. We copy from *La Lumiere Electrique* a description of the manner of fixing the wires, together with some other particulars, from which it appears that the development of electrical improvements there is not altogether without its difficulties. Our contemporary says: "The state has indeed been obliged to grant telephone patents, but by reason of a peculiar construction of the law, a premature communication made to the Academy of Sciences lost the Bell patent. Following Bell, a host of inventors have made improvements of considerable importance, and have organized systems of call, etc., that have rendered the telephone a valuable instrument that man will make more and more use of. What has the state done to aid this new progress? It has not even deigned to preserve a neutrality; it has stretched out its powerful hand, and, when a few men have come to ask permission to organize a telephone service like those of other countries, it has begun by demanding the renunciation of their patents in its favor, and imposing enormous taxes. It has also written in the concessionary contracts that it reserves to itself the right of competition and even of expropriation at any moment, and in exchange for all these rebates it has accorded concessions for five years, leaving to the grantees the care of obtaining from whoever it might be permission to place their wires upon the roofs of houses.

"It required great courage on the part of the companies to face those difficulties of all sorts that could not fail to arise in a country where property is so divided that it necessitated as many agreements as to location, in putting up the aerial lines, as there were telephone poles. The honor of putting up the first telephone line in Paris is due to Dr. C. Herz. The house Postal-Vinay took the enterprise in charge, and carried it through in a very remarkable manner.

"Fig. 3 represents the roof of a Parisian house upon which two men are fixing a frame with its insulators. The one in the foreground is holding a rope, which he will quickly draw up as soon as he hears the whistle of the foreman. Another man, upon the roof of the opposite house, will do the same thing, and the astonished passer-by will see a telephone wire rise that a few moments before lay in the middle of the street. The foreman has awaited for a favorable moment before giving the signal. Regardless of the hour, and notwithstanding the passing of pedestrians, coaches, and omnibuses, several hundred miles of telephone wire were stretched over the roofs of Parisian houses in this way.

The wire chosen by preference was of steel, 0·08 inch in diameter, which was then considered as less dangerous to passers-by in case of breakage, and as less disagreeable to the sight, than the ordinary telegraph wire of double the size. To-day, if it were necessary for Paris to return to aerial telephony, there would be no hesitation in using Montefiore phosphoric copper or Mouchel bronze wire.

"The recent improvements in telephony, especially as regards calls, would permit of the use of copper wires 0·02 inch in diameter, or even still finer ones. Such wires combine within themselves those conditions of economy and security that are looked for in towns where sewers are rare or infectious. Such is not the case with the city of Paris, which in this respect is perhaps the best endowed of any other in the world, thanks to the labors of that great engineer, the late Mr. Belgrand, and his eminent associates, the Alphands, the Huets, etc.

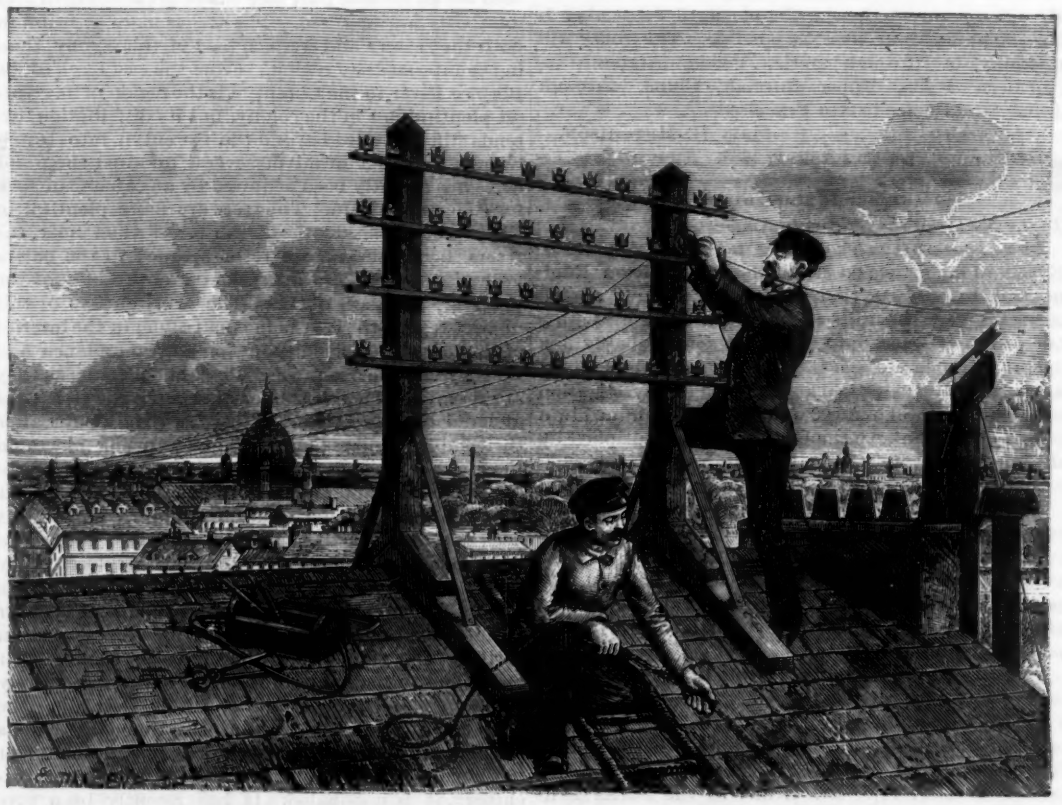


Fig. 3.—HOUSE TOP LINES IN PARIS.

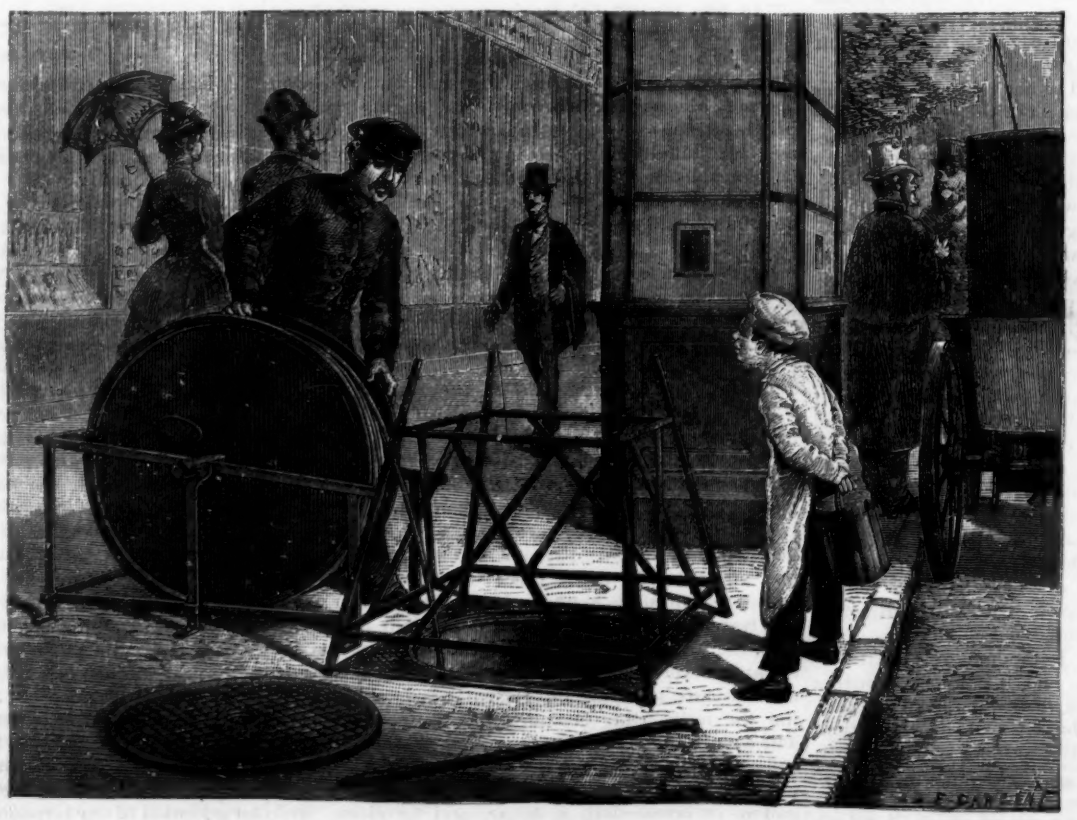


Fig. 4.—LOWERING THE WIRES INTO THE SEWER.

"The sewers of Paris have became a place of promenade for strangers. In the larger ones, those under the principal thoroughfares, the traveling is done either by car or boat. The others, although of smaller dimensions, are of easy access to workmen who are especially shod for the occasion.

"The increase in the number of subscribers to the telephones rendered the owners of the houses of Paris more exacting as to location, many of them demanding 100f. annually, and some even 200f., for a simple pole fixed alongside a chimney, without counting those who requested to be released from their contract because of the Æolian harp-like noise that the lines made. An endeavor was made to satisfy the latter by the use of special deadeners. The steel wire, interrupted in the vicinity of the insulator (Fig. 1), was replaced by a rubber covered cord, and an electric junction was made by a lax wire called a ligature. This situation became daily more troublesome, and in 1880, upon the fusion of the first companies into a single one that still bears the name of Societe Generale des Telephones, the city of Paris, authorized by the Common Council, opened its sewer at a certain rental to telephony, as it already had done to telegraphy. It rented for four years a space 12 inches wide by 4 deep on the sewer arch, and this permitted the Society to affix triple hooks (Fig. 2) thereto, that support 51 multiple cables of 14 conductors each. The very slight distance (a few hundredths of an inch scarcely) between any two conductors did not

permit of using the ground as a return wire, and the induction was such that a conversation transmitted by one wire was heard in the contiguous one with an intensity equivalent to that of a direct conversation. Calls and telegraph signals also produced very intense noises that were called, by analogy, "frying." Consequently, it became necessary to employ two simple conductors for each line, and, as a further precaution, these were twisted together loosely and covered with cotton of one color. Seven couples of wires whipped about with cotton of different tints, in order to prevent confusion, were covered with tarred tape, and placed in the same leaden tube (analogous to those used for gas), which was again drawn after the introduction of the conductors.

"These multiple, 14-wire cables, which serve to make but 7 lead-covered conductors, have an external diameter of ¾ of an inch, and cost from six to twelve cents per running foot, according to the market price of copper, lead, and gutta percha. Their length is about 1,300 feet, and it is only at their extremity that are soldered the small individual lead-covered cables that run to each subscriber. These small cables usually have a diameter of 0·3 of an inch, and cost from one and one-half to three cents per running foot, according to the price of material and labor.

"The improvements made in telephony would allow of the use of much finer, and consequently much cheaper, wires, and so much less cumbersome ones that the number of subscribers might be quadrupled and easily quintupled without a demand for more space in the sewers, as required by the city engineers.

"All Parisians have seen a telephone cable paid out alongside of a sewer manhole (Fig. 4). The cable is wound around an iron drum whose axle is carried by a flexible frame of forged iron. It is pulled by the lower extremity and is laid along the sewer sidewalk. When the part necessary to rejoin the point of soldering is down, the men finish the unwinding in moving in the opposite direction. In this way, dragging is avoided, and no risk of straining the cable or of tearing the external covering is run.

After this, the cable layers, standing on small ladders or the city water mains, pass the cable over the hooks that have been sealed into the walls in advance. As may be seen, this operation is exceedingly simple, and presents none of the dangers of aerial work.

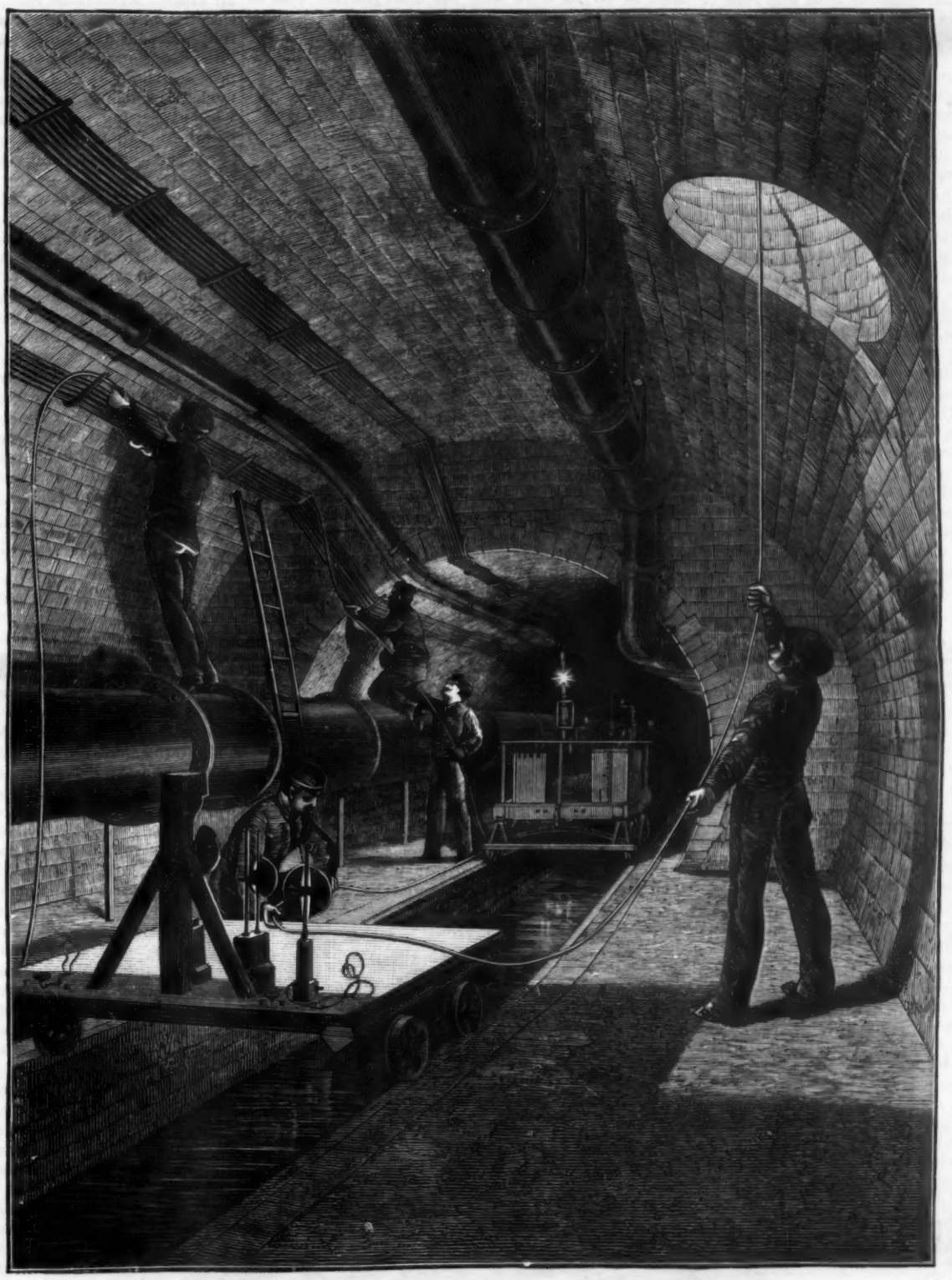


Fig. 5.—LAYING TELEPHONE CABLES IN A PARIS SEWER.

Fig. 5 represents the interior of a large sewer during the laying of a cable. One of the large pipes serves to distribute the water of the Seine for sprinkling purposes, and the other, reservoir water for drinking, etc. The small pipe belongs to the pneumatic post, the still smaller one is for the atmospheric distribution of time; and of the groups of cables, one of them belongs to the telegraph system, and the other to the telephonic. This engraving was made from a photograph taken by Nadar through the aid of electric light."

BROMINE.—A correspondent of the *Monthly Mag. of Pharmacy*, writing from Messina, says: "A bottle of bromine left in a closed room all night with the stopper out destroys all infection and insect life. I have cleared places which were infected with vermin many times. It is far more effectual than the vapor of burning sulphur."

Hints on Type Setting.

In composing, the left hand, which holds the stick, should always follow the right, which takes up the letters. If the left hand remains stationary, much time is lost in bringing each letter to it, and traversing a greater space than necessary; the eye should always be fixed on the nick of the letter before the finger is ready to take it up; this will effectually prevent any false motion, as it may be lifted and conveyed to the stick in its proper position. A sentence of the copy should, if possible, be taken at one time, and while putting in the point and space which conclude that sentence, the eye is at full liberty to revert again to the copy for a fresh one. It is to perfection in this particular that those compositors who are so much admired in the business are indebted for their swiftness. The time they thus gain is considerable, without any appearance of bustle or fatigue. By thus taking into the memory a sentence at a time, they preserve the connection of their subject, which renders punctuation less difficult.

From habit the compositor becomes so well acquainted with the peculiar feel of each type that he can generally detect a wrong letter without looking at it. Those who are careful in distribution find the advantage of it in composition. The greatest disgrace that can attach to a compositor is that of being considered a foul or slovenly workman—to avoid which should be his earnest endeavor; it would be even better to read every line as he composes it than to lose so much of his time at the stone, independent of the disgrace attached to a man of this description. We would recommend him to cast his eye over the line as he justifies it; this method, properly acquired, will not detain him in his work, but will enable him to be much more accurate.

Sulphurous Acid in the Air of Towns.

M. Witz has conducted a series of observations upon the presence of sulphurous acid, due to the combustion of coal and gas, in the air of towns, and its effect upon the salubrity of localities. Daily analyses of the atmosphere of the largest French towns go to show that the proportion of ozone in the air is very variable. Generally, a northerly wind is accompanied by a diminution of the quantity of ozone. The exact value of ozone as a constituent of the air of towns is not known; but the fact that it is generally scarce or altogether absent during unhealthy periods is held to testify to its sanitary influence. M. Witz has been led to believe that the absence of ozone is caused by the superabundance of sulphurous acid. This latter is an invariable constituent of the air of towns in which coal is burnt in large quantities. Thus at Rouen, where M. Witz conducted his experiments, he has observed that the bright orange placards commonly used for advertising, being colored with red lead pigment, always become blanched in time. The peroxide of lead passes into the state of sulphate, and protoxide to that of sulphite.

Long continued observation of these placards, posted in the interior and round the suburbs of the town, has shown M. Witz how to graduate the area of chemical action according to the density of the population and number of furnaces in operation.

Inside dwellings the same effect is much more marked, especially if the colored paper is placed in the way of condensations from humid atmospheres. The presence of sulphurous acid in the air of manufacturing towns becomes very evident in connection with the first white frosts of winter. A great deal of the acid vapor is then condensed with a small quantity of water, and its effect upon exposed objects is sometimes very destructive. Hence M. Witz demands that, out of consideration for the public health, means should be taken for reducing to the lowest possible proportion the sulphurous acid vapor emitted from factory and other chimneys.

The *Journal of Gas Lighting* says: Unfortunately for the reasoning that would connect the diminution of ozone (and consequently the preponderance of unhealthy atmospheric conditions) with the presence of sulphurous acid, it is a fact, requiring to be otherwise accounted for, that ozone disappears and epidemics rage in districts where not a pound of coal or a cubic foot of gas has ever been burnt.

Powdered Crab as a Medicine.

A Russian paper says: "During the last fifteen years the inhabitants of a malarial locality in Kharkoo Government in Russia have used the *crab powder* with great success against the fevers. The powder is prepared in the following way: Live crabs are poured over with the ordinary whisky until they get asleep, then they are put on a bread pan in a hot oven, thoroughly dried and pulverized, and the powder passed through a fine sieve. One dose, a teaspoonful, is generally sufficient to cure the intermittent fever; in very obstinate cases, a second dose is required. Each dose is invariably preceded by a glass of aloe brandy, as a purgative. The powder is used in that locality in preference to quinine."

The Longest Tramway Rope in America.

A tramway rope and fixtures are now being placed at Sewell, W. Va., near Gauley Bridge, from the cliffs on the other side of the river down to the Chesapeake and Ohio Railway. The original design is by Col. F. Warburton, R.E., of the British army, who by this means once transported an army with all its equipments across a New Zealand river.

The owner is G. M. Donaldson, of Richmond, Va., of Donaldson & Sons, Scotch timber merchants. He owns about 10,000,000 feet of oak and a smaller amount of other lumber. It lies on the rolling highlands which stretch back from the top of the New River canon. The mill is three-quarters of a mile back from the cliffs, and connected with the rope bridge by a tramway. Height of cliff, 475 feet above the rails; inclined distance, 1,504 feet and nine inches. This distance is being spanned by a two and three-eighths inch wire rope of best crucible steel. The towers supporting the rope stand a little forward of its ends, making 1,466 feet clear span, and the fall 465 feet. The sag of the rope is 62 feet. The towers are of wood, 28 feet high, and held in position by two eyebars 5x1¼ inches. On each tower is a heavy cast iron saddle, transferring the tension of the rope to the anchorages. The ultimate strength of the rope is 190 tons. Maximum working strain under a load of five tons will be 42 tons. The loads will be from 1,000 to 1,200 feet of lumber. Twenty-five trips a day will be made until the lumber on storage is shipped, when the trips will be reduced to fifteen. The lumber is from 18 to 24 feet long, and the difficulty is to transport it without injuring the edges.

This is done by a cage invented by Mr. W. Hildenbrand, the engineer in charge, the bottom of which consists of two movable beams, which, when turned sideways, leave the cage without bottom, so that it can be placed over the timber, and after the bottom beams are turned back again the timber can be easily lifted from the truck. This will be done by a pair of differential pulleys, with which also the height of the cage can be regulated according to the weight to be transported.

The cage is suspended from a carriage 17 feet long, with five cast iron wheels. An endless ¾ inch steel rope over two 36 inch drums serves to pull the load over when gravity fails, and to pull the empty carriage back. This rope has a strength of 14 tons. The engine has two 8x10 cylinders, and will carry about 65 pounds of steam. It was built specially, because none could be found answering the conditions.

John A. Roebling's Son's Company are putting up the affair for Mr. Donaldson.

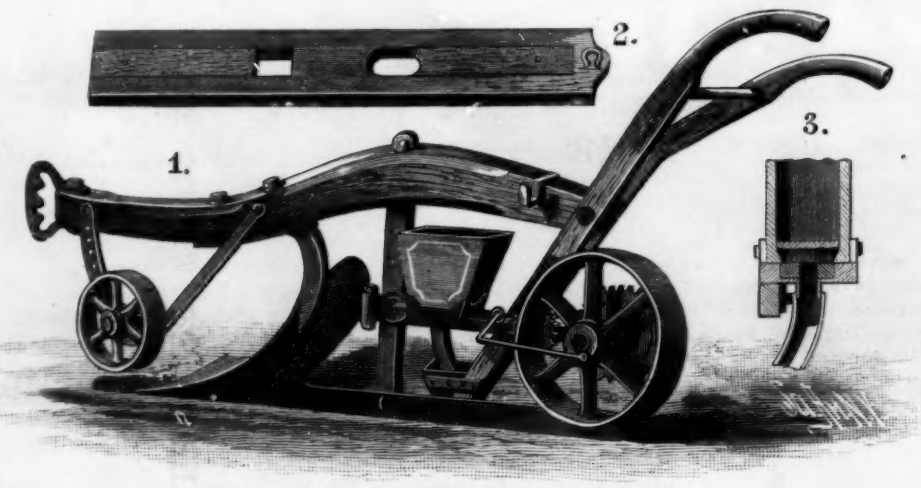
Its importance consists not so much in the fact that it is the largest tramway rope in America, which is true, but because, if it is an economic success, similar constructions are almost certain to be used in all parts of this section, and not only for lumber, but for coal, and perhaps iron ore and limestone.—*N. W. Lumberman*

COMBINED PLOW AND SEEDER.

With the aid of the machine shown in the accompanying engraving, hitherto unbroken soil may be plowed and planted at the same time. The forward guide wheel can be held at any desired height to govern the depth of the furrow. The bar supporting the seed hopper and the mechanism for operating the dropping slide is secured at one end by a double hinge joint attached to a yoke on a standard connecting the beam and landslide. The dropping slide is fitted in the floor of the hopper, and may be connected by a pitman with the drop wheel, which is journaled in bearings on the opposite end of the bar and runs on the land beside the plow. The double hinge joint permits the bar to swing sidewise and also to rock up and down, to allow the drop wheel to always run on the ground no matter how the plow may be shifted about, and leaving it free to rise and fall in passing over roots or clods of earth; hence the drop wheel will move the slide regularly to allow the seed to fall through a hole in the hopper bottom, through a flexible tube and funnel held to the handle by straps, to the ground. The slide is made with two plates (Fig. 2 is a plan, and Fig. 3 a sectional view) fitted to slide in slots made in the upper face of the slide, the slots being cut through at the inner ends to permit the passage of the seed. Both the holes can be made larger or smaller, to deliver a greater or less quantity of seed, by shifting the plates in the slide. A brush cut-off is fixed in the hopper over its discharge hole.

When the drop wheel, which is preferably 36 inches in diameter, is connected by its rod to the slide, and when one of the seed apertures is closed, but one drop of seed will be made for each revolution, and when both holes are open two drops of seed will be made, allowing the seed to be planted in hills 36 and 18 inches apart respectively. To plant closer the rod is disconnected, the gear wheels shown in the engraving are set to mesh with each other, and a short rod connects a wrist pin on the small gear with the dropping slide; thus the seed will be planted in hills 12 and 6 inches apart, by properly setting the sliding plate, as will be easily understood.

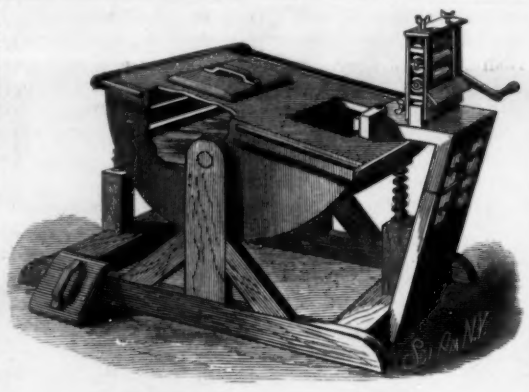
This invention has been patented by Mr. Allen Glenn, of Scranton City, Iowa.



GLENN'S PATENT PLOW AND SEEDER.

A NEW WASHING MACHINE.

An easily operated clothes washer, and one calculated to do its work with the least possible wear of the clothes, is shown in the accompanying illustration. The body is made semicircular in form, and pivoted between uprights of the frame, where it is adapted to swing, cross pieces at the top on each end of the body alternately striking springs supported by uprights to aid in continuing the motion. The cover has openings, fitted by smaller covers, and the sides of the body have rounds or small rails along the top edges, by which it may be conveniently rocked upon its pivots. The body has ridges or ribs on its bottom over which the clothing rubs as the machine is operated, the whole bottom being lined with zinc or other suitable material, and a wringer is so attached that it may be easily swung into or out of position for use.



FALKENTHAL'S WASHING MACHINE.

This invention has been patented by Mr. Henry Falkenthal, of Bozeman, Montana Territory.

To Test the Quality of Leather Belts.

For testing the quality of the leather used for belting, Mr. Eitner proposes the following simple method: A small piece is cut out of the belt and placed in vinegar. If the leather has been perfectly tanned, and is therefore of good quality, it will remain immersed in the vinegar, even for several months, without any other change than becoming of a little darker color. If, on the contrary, it is not well impregnated with tannin, the fibers will promptly swell, and, after a short time, become converted into a gelatinous mass.—*Revue Industrielle.*

Hemp for Phylloxera.

They recommend, in South Russia, hemp as a means against the phylloxera. It is sufficient to plant the hemp around the vineyard, and place it near the infected vines. The insects are attracted by the strong odor of the hemp, the roots of which prove to be poisonous for them. The following experiment will show the efficiency of this means: Plant in the same barrel an infected vine and a hemp plant. In a few days the vine begins to revive, and if you pull the hemp carefully out, you will find its roots covered with phylloxera.

Hay Fever.

Careful observations fully bear out the germ theory, not only the presence of the germs, but an agitation or disturbance of the germs being a cause of the malady. For instance, upon a not very sultry day, three or four hours in the country have been spent without inconvenience; but on the same day, half an hour in an express train has sufficed to bring on the most aggravated symptoms; in the same way, in town, a week or two has been passed without trouble, but a couple of hours at an open air exhibition, in the same locality, with a moving crowd stirring up dust and pollen, have produced a violent attack.

The only check to hay fever appears to be, first, sleep; second, freedom from pollen; the so-called cures, such as snuff, or other application to the nostrils, being perfectly useless. The above conditions combined effect an almost miraculous cure, as has been proved by sleeping for a short period under the protection of carefully wetted cloths through which the air is, as it were, filtered, or more certain still, a night spent at sea. Experience shows that if the attack is once stopped, a moderate amount of exposure to germs may be risked without setting it up again. The conclusion to be drawn from this is, that it would be worth the while of some enterprising individual to establish a "hay fever cure."

The arrangement would be extremely simple, neither more nor less than a series of sleeping apartments into which nothing but air deprived by straining through wet flannel of all germs, and possibly cooled down to about 55° or 60°, could penetrate. Upon a large scale, such an establishment could be easily worked at a profit, in connection with any of the large Turkish baths or other similar establishments in town.

The beneficial effects of low temperature have been conclusively proved by subjecting a hay fever patient to the action of one of the preserving chambers in a cold store for meat. The remedy, however, was too violent to be generally adopted, but a temperature of 50° would, no doubt, suffice, and could be, of course, borne without inconvenience in the hottest summer.

A Wonderful Peruvian Railroad.

One of the most wonderful pieces of engineering in the world is the railroad stretching from Lima and Callao to the crest of the continent, where the famous mines of the Cerro del Pasco are, the source of the ancient riches of the country, from which tons upon tons of silver have been taken, and which still hold, if the testimony of the mineralogists can be relied upon, the richest deposits on the surface of the world. The railroad was never completed. Mr. Meiggs carried it from Lima to the crest of the Andes at a cost of $27,000,000 and 7,000 human lives, and gained for himself a reputation for energy and ability surpassing any man that ever came to this continent, but he died with fifty miles of track yet to be laid. No one has been found with the courage to finish the work, until a few weeks ago Michael Grace, of New York, whose brother and partner in that enterprise is the mayor of that city, made a contract with the government under the terms that he is to be given the road as it stands, with all its equipment, if he will complete it to its original destination. He agrees to complete the remaining fifty miles of railroad and pump out of the mines of Cerro del Pasco the water that has been accumulating in them for half a lazy century, in consideration for which the government gives him that portion of the road already completed, and all the silver he can get out of the mines during the next ninety-nine years, he paying the nominal rental of $25,000 a year for the use of the property. The sensation of riding up this railroad, together with the rapid ascent from the sea level to the mountain's crest, produces a sickness called "siroche," often fatal, and usually sending people to bed for several weeks. The symptoms are a terrible pressure upon the temples, nausea, bleeding of the nose and ears, and faintness, but the effects can be avoided by taking precautions and observing rules that experience has suggested, the chief ones being to take a glass of brandy and keep perfectly quiet, as the slightest degree of exercise will floor the strongest man. People who are compelled to make the ascent, if they have not become accustomed to it, usually take two or three days for the journey, stopping off at the stations along the line, and going to bed at once upon reaching the town of Chicla, which stands at the summit.—*Philadelphia Times.*

SOME WONDERFUL FLIERS.

BY C. F. HOLDER.

The most striking and interesting animals of the olden time, particularly that known as the Mesozoic, were the fliers—reptiles adapted for a life on the wing, and so marvelously constructed as to be the subjects of never-ceasing curiosity.

The flying lizards, or *Pterosauria*, have left their imprints on the bottom of our great inland Cretaceous sea, that now, a dry, arid basin, lies exposed, a wonderful and prolific collecting ground for the geologist.

The first pterodactyl was discovered by Colleni, in 1784, and attracted as much attention at the time as the discovery of a *bona fide* sea serpent would to-day. The naturalists of the period, and even later, were completely nonplussed. Colleni himself described his find as a fish. Blumenbach thought it a bird. Sommering was equally positive that it had mammalial characteristics, while Spix was certain that in its structure he saw a form intermediate between the monkeys and bats. On the other hand, Macleay considered that it was a connecting link between the birds and the mammals, and so the war of opinions waged until, in 1800, Cuvier determined its proper position.

The European pterodactyls were veritable dragons, their long beaks were armed with sharp teeth, and they ranged in size from a foot to sixteen feet across the wings. Naturally the American forms are the most interesting to the reader upon this side of the water, and they possessed characteristics that were remarkable in the extreme. They differed from European forms in being devoid of teeth, and compared to them they were veritable giants. To Prof. Marsh, of Yale, is due almost the entire credit of the discovery of these gigantic creatures, to which he has applied the name *Pteranodon*. They all come from the bed of the old Cretaceous sea of the West, or the locality in Kansas that is known as the chalk deposit or bed. They ranged from creatures as large as a snipe to monsters having a spread of wing twenty-five feet across.

In the accompanying cut a conjectural view is given of one of the largest of these animals, showing how, possibly, it may have appeared when alive, the figure of a man being introduced to give some idea of the size. Such a picture is, of course, faulty from the total lack of material to work upon, but it will, perhaps, serve the purpose intended, of showing how like the typical dragon these strange creatures were. Prof. Marsh, in referring to these forms, says in substance:

The first remains of pterodactyls found in this country were discovered by him in the autumn of 1870, near the Smoky Hill River in western Kansas. These belonged to a gigantic species, which he described as *Pteranodon occidentalis*. The geological horizon from which they were taken was the middle Cretaceous, or the same from which he took the now famous toothed birds. For several years he kept collectors at work in the locality, with such success that the Yale College Museum now has the remains of over six hundred of these reptiles. All of the large ones belonged to the genus *Pteranodon*, and a single species of another genus, *Nyctodactylus*, was also found. In one of the large forms—*Pteranodon ingens*—the skull alone measured four feet in length, and the appearance of this toothless monster can well be imagined.

An extremely interesting feature of these forms is their resemblance in structure to the birds; in reality they were reptilian bats, forming, perhaps, a link between the reptiles and the birds. Some of the striking features are the long neck and head; the jaws, perhaps protected by beaks; the skull, with its large orbits, and the brain. The sternum was keeled, as in the birds, and the shoulder girdle was bird-like. On the other hand, the pelvis and limbs are those of a lizard, while the enormously extended little finger seems a unique feature. The limb bones were hollow, as in the birds, and they also had air cells, so that these strange creatures seemed to combine the features of several groups.

Of the Old World and toothed forms the *Rhamphorhynchus phyllurus* was, perhaps, the most remarkable. It was also secured by Prof. Marsh, and is now in the museum at Yale, while casts can be seen in the geological collection of the museum at Central Park. It was found in the slate at Salenhofen, Germany, and is principally remarkable for its extremely long and rudder-like tail. The specimen restored represents a curious, bat-like creature with leathery wings, with a long snout filled with teeth, so that it was quite ferocious in appearance. On the ground it probably waddled along with a tottering tread, much like that of the bat; but when it rose in the air, its strange make-up was still more apparent. The tail commenced like that of the bat, but it was very long, and at the extreme end widened out into a veritable rudder, that was evidently used to steer this weird, dragon-like creature through the air.

The rudder was composed of two membranous leaves or folds, that extended from each side of the tail, forming a leaf-shaped organ, supported and held in shape by numerous bones, like the ribs of a fan, that branched out from the backbone and held it in place, so that there was no flapping about, the rudder always being steady and at the will of its strange possessor.

The appearance of the western country at this time can hardly be imagined. There probably could be seen hundreds of dragon-like pteranodons at the close of day rushing out of their dens or from the forests, and soaring about as do our bats of to-day! Such was their great size that, if they congregated in numbers, as we are led to suppose from the enormous quantities of their bones found, they must have fairly darkened the earth as they soared along.

BAT-LIKE PTERANODON OF A FORMER AGE.

It is probable that they found much of their prey in the water, and evidently dived into it much after the fashion of our pelicans, though their victims may have been some water birds that floated upon the surface. As their habits were quite similar to those of bats, in all probability they clustered on the cliffs on the sides of streams, clinging to the edges or, perhaps, the branches of trees in groups, fanning the air and each other with their great leathery wings, or snapping their jaws at one another in fierce rage; and when alarmed they would rise in vast flocks, casting dark shadows on the waters below, and soar noiselessly along, the terror of these ancient days.

The story of these animals is entirely told by the hardened rocks that contain their remains. They died, fell to the earth, or possibly into the water, sinking to the bottom, and as the animal matter became macerated and was lost, the bones retained their natural position, and soon became covered with a thin coating of mud that concealed them like the clay of a cast. Year after year fresh layers of sediment were deposited, until, finally, perhaps the stream changed its course, or the land became elevated, so that the water was withdrawn and the mud began to harden in the sun, in time becoming a solid rock. Leaves and the debris of vegetation fell upon it, mould accumulated, seeds took root, and soil formed, until in years a thick stratum of earth was deposited and great trees covered the ancient beach. This period may have lasted for ages; then, from perhaps a sinking of the crust, would come a change; water would flow in and kill the trees, as we often see in overflowed ponds and lakes; the roots would in time decay and then disappear, or be covered up with a deposit of mud that would perhaps form in ages another stratum hundreds of feet thick; and so this piling and growing would continue until finally our bat-like creature is buried far beneath the crust, to be dug out ages after by the miner; or, again lifted to the surface by some cataclysm or earthquake, it becomes exposed, and tells the story of this olden time.

How Rails are Pounded.

If we stand at a moderate distance from a railroad track and watch an express train as it rushes past, everything seems perfectly adapted to its purpose, and the engine and train seem to glide over the rails with perfect smoothness. This smoothness of action, however true it may be with respect to the ears, is, in the case of the engine itself, only apparent. The ordinary locomotive, owing to peculiarities in its construction, so far from being in reality the perfect machine which poets rave about, is quite a different affair. This is, however, in a great measure due to difficulties which are, owing to the peculiar condition under which they arise, practically very hard to overcome.

The locomotive, as generally constructed, says a writer in the publication called the *Locomotive*, is subject to very severe internal disturbing forces, some of which are of such a nature that they not only (at high speeds) seriously strain parts of the engine itself, but become an actual element of danger, on account of their tendency to cause breakage of wheels, rails, and even bridges, unless great care is exercised. Probably the most serious of these internal disturbing forces is due to the fact that it is simply impossible to perfectly balance the reciprocating parts of the engine in the ordinary form of construction. In consequence of this lack of balance, an engine in motion delivers through its driving wheels a series of blows upon the rails at every revolution, which, in the case of an ordinary express engine, running at a speed of 50 miles per hour, has been calculated to be equal to a load of over six tons, suddenly applied. This is repeated at the above mentioned speed over four times every second. The effect of this tremendous blow so often repeated is seen in the breakage of rails in frosty weather, and unless due care is exercised it is the prime factor in the destruction of bridges. The cause of this "hammer blow" is this: To prevent injurious regularities of motion in a horizontal, or fore-and-aft, direction, and which would be seriously felt in the train, one must put sufficient weight on the driving wheels to counterbalance the crankpin hub, crankpin parallel rods, and one end of the connecting rod. Thus we see that there is necessarily an excess of counterbalancing weight in a vertical direction, and it is this excess which strikes the severe blow above referred to. The effect of this blow on the driving wheels themselves is to flatten tires after a comparatively short season of running; this flattened spot may easily be seen by examining the wheels of an engine after they have run a few months. A good idea of the magnitude of this hammering action may be obtained by examining this flattened spot.

With the high speeds which will be demanded of our railroads in a few years, it seems to us that it will be a measure of very great economy, if not absolute necessity, for railroads to adopt some modified form of construction which shall enable more perfect balance of the reciprocating parts to be attained, as the saving of fuel, and wear and tear of rolling stock and roadbed, to be gained thereby would be very considerable.

A NEW alloy of manganese and tin is brought out by Messrs. Billington & Newton, of Longport. It is suitable for bearings in which shafting is required to run at high speed, for steamship propellers, and where a high degree of tenacity and closeness of grain are requisite.

ENGINEERING INVENTIONS.

A car ventilator has been patented by Mr. Alfred S. Emerson, of Charleston, S. C. Combined with the car is a shaft driven from the axle, which works an air forcing blower, according to a special construction and arrangement of parts, to supply railway cars with fresh air, and carry off the foul air.

A piston rod packing has been patented by Mr. John W. Dudley, of Portland, Oregon. It is composite, comprising split metal rings with inclined meeting faces, causing their lateral expansion under pressure, to be placed around the piston rod or valve stem, with a fibrous elastic packing placed outside the metal packing rings, next the wall of the stuffing box.

An oscillating steam engine has been patented by Mr. William Elder, of Fort Cœur d'Alene, Idaho Ter. This invention covers a particular construction of the oscillating trunnion cut-off, the reversing valve and reversing mechanism, and arrangement of oiling chamber in the trunnion box, to make such engines more simple and easily controlled.

A car coupling has been patented by Mr. Philo J. Norton, of Bristol, N. Y. The drawhead has a transverse buffer bar arranged to slide therein in the direction of its length, the bar being guided by slots in the sides of the drawhead and pressed toward the outer end thereof by springs, while the coupling link has a longitudinal slot, prongs at each end, and a head or disk on the upper surface at each end.

A rotary engine has been patented by Mr. Adna Wildern, of Vienna, Ontario, Canada. Two cylindrical cores or rollers are fitted in contact and forming abutments, and to each of these cores a piston is rigidly attached, the pistons passing each other by means of a recess in each of the cores; steam is admitted through ports in heads of cylinder, and passes through grooves in ends of one roller to piston, and exhausts in similar manner through grooves in end of opposite roller and then through ports in heads of cylinder.

AGRICULTURAL INVENTIONS.

A reversible plow has been patented by Mr. William C. Haulbrook, of Homer, Ga. The construction is such that the plowman can, by pressing a lever, release a handle block, so the plows can be reversed by swinging the beam to one side, and quickly fixed firmly in place, so that there can be no shaking of the parts when in use.

MISCELLANEOUS INVENTIONS.

A strainer for funnels, etc., has been patented by Mr. Francis O. Butterfield, of Lynn, Mass. It is preferably made of wire cloth rolled into tubular form, and made slightly tapering to fit tightly in a tube at its lower end, to strain any liquid poured through funnels and obviate the clogging up of the funnels.

A bowling hoop has been patented by Mr. James H. Venners, of Philadelphia, Pa. It has an indicator tripper on its inner peripheral surface within the uninterrupted open space circumscribed by the hoop, for use in connection with a speed indicating propelling handle, for guiding as well as propelling the hoop.

A wheel has been patented by Mr. George W. Mecham, of Columbia, Texas. This invention covers novel features in that class of expanding wheels in which the hub has an inclined abutment on which the inclined ends of spokes rest, the spokes being clamped in position and adjusted on the abutment by clamping collars.

A cane has been patented by Messrs. John Dierks and Thomas B. Kail, of Harlan, Iowa. It is formed of a series of paper disks or wads, with strips on the surfaces and mounted on a rod, the disks being pressed together or united by adhesive substances, to produce upon a cane or similar article an ornamented outer surface.

A butter worker has been patented by Mr. James H. Taylor, of Westfield, Mass. This invention covers an improvement in that class of butter workers in which a roller works over the bottom of a box or tray containing the butter, the worker being operated by a rack and pinion and a crank, and so the brine and milk pressed out can flow away.

A hub for vehicle wheels has been patented by Mr. Alfred Bradley, of Dayton, Ohio. This invention covers a novel construction intended to so form the tenon that compression will not affect its fibers, and that the expansive force of compressed tenons will operate on the interior of the hub while the periphery will be free of strain.

A spring seat has been patented by Mr. George W. Murray, of Bluffton, Ohio. This invention covers a special arrangement of high and low springs in the same seat, with their action so controlled as to form a level seat or cushion on their united tops, and so their action shall be proportioned to the weight to be supported.

A water color solution has been patented by Mr. Charles F. Nicholson, of Rochester, N. Y. This invention is intended to provide artists with colors in a moist form or state, and provides a solution or vehicle for the colors, composed of glucose, gum arabic, and sirup, the colors being thus prepared in a special manner, to avoid too much wetting and drying.

A combined stern sheet block traveler, oar lock, and cleat, for boats and other vessels, has been patented by Mr. John Richardson, of St. Mary's, Ga. This invention covers a plate attachment designed to be arranged across the stern or rear end portion of the deck, and carrying various appendages to promote convenience, but which may be changed or added to as desired.

A heel plate for skates has been patented by Mr. John B. James, Jr., of Riverdale, N. Y. It has an elliptical aperture through it around which is formed a flange or collar to support the flanges of the skate stud, the opposite sides of the collar having oppositely inclined edges to act as cams to draw the heel of the skate firmly against the heel of the boot or shoe.

A machine for measuring and trimming fabrics has been patented by Mr. George W. Parsons, of Burlington, Iowa. Combined with a fabric roll and bar for winding the fabric is a tension bar over which the fabric is passed, a measuring roller, with a knife and means for operating it, so it can be adjusted a greater or less distance from the edge of the fabric.

A cant hook has been patented by Mr. Aaron Brown, of South Barton, Vt. Combined with the handle or lever and the hook, with its retaining collar, is a plate opposite the inner end of the hook, let into recess in the lever, and having studs at its ends to limit the movement of the hook, the device being cheap, and presenting a considerable range of adjustment.

A process of making a fertilizer from tank waters has been patented by Mr. Charles Gibson, of Chicago, Ill. It consists in adding acid sulphate of an alkali, aluminous cake, or sulphate of alumina to the waters, then boiling down to expel the surplus water, agitating the mass with a carbonate, oxide, or hydrate of an alkali or alkaline earth, and finally cooling and grinding.

A heating and ventilating apparatus has been patented by Mr. John L. Hamilton, of St. Joseph, Mo. The invention consists in a peculiar construction and arrangement of hot air flues and passages, air chambers, and ventilating flues, with a fireplace in the lower room, and its smoke flue, designed to heat and ventilate upper and lower rooms by a fire on the hearth in a lower room.

A nut lock has been patented by Mr. Isaac Van Kuran, of Omaha, Neb. This invention covers an improvement on a former patented invention of the same inventor, and consists in combining with a base plate, having lips or ledges at the corners, a top plate over the corners of which the lugs are bent to hold the plates together, the two united plates forming a spring washer for locking nuts.

A turbine water wheel has been patented by Mr. Barnet V. Idol, of Idol's Mills, N. C. This invention covers a wheel with two series of curved arms, making buckets both horizontal and vertical, inside the casing, giving the water a wide passage where it enters, which gradually diminishes, the water doing duty first on the horizontal and then on the vertical buckets.

The manufacture of white lead forms the subject of a patent issued to Mr. William H. Wetherill, of Philadelphia, Pa. This invention covers an improvement in the method of manufacturing white lead by the Dutch process by replacing the tan bark usually accumulated around the pots containing the acid and buckles of lead with a layer of ground of fibrous spent licorice root.

A road grader and leveler has been patented by Mr. John Skinner, of Newman, Ill. The machine combines a main frame with harrow and scraper, a shoe pivoted at one end to the framing and adjustable thereon in position to engage the ground with pivoted levers, and other novel features, for loosening and scraping soil and earth to a grade, and filling ruts and depressions.

A hammock support has been patented by Mr. Charles A. Lindblom, of New York city. The device consists of a number of pieces of wood and metal so shaped that when put together they form two uprights or standards connected by and braced to a tie bar, making a frame with removable extensions, and one which can be easily and quickly taken apart and its pieces packed into a small space.

A tobacco box has been patented by Mr. Albert M. Guyton, of Broad Top, Pa. It has two compartments, one for holding the plug and another for a knife to cut it, with slides, push knobs, and a hinged cover, and so arranged that the end of the plug may be projected sufficiently to allow the desired portion to be cut off without handling the whole, the plug being thus kept moist and clean.

A ratchet wrench has been patented by Mr. Albert H. Rollin, of Coldwater, Mich. The ratchet head has a series of cams which coincide with and work movable jaws, peculiarly constructed pawls engaging with teeth on the cam head, there being a spring for releasing these pawls, an oscillating handle with operating pawls, and a collar adapted to throw out of engagement either or both of the operating pawls.

A windmill has been patented by Messrs. Daniel D., George L., and Charles W. Wiley, of Lanark, Ill. This invention covers improvements in mounting the side vane to be easily shifted in contrivances for automatically shifting it, and so the side vane may be used as an automatic regulator to prevent the wheel from being suddenly thrust around with the shaft in geared mills when the load is suddenly turned on or clutched with the shaft.

An apparatus for filling bottles with highly aerated liquids without pressure has been patented by Mr. August Werner, of New York city. The invention provides for the use of a fountain charged in the ordinary manner, such fountain to be placed upon a peculiarly constructed cradle, and the unabsorbed gas allowed to escape at the top; by a hand wheel the cradle is then so inclined that the liquid will flow out of a rubber tube at the top into the bottles to be filled.

A cylindrical amalgamator has been patented by Mr. James W. Hilton, of New York city. The shell has V-shaped flanges on its interior, with perforations and slots, to facilitate in the operation the constant stirring and mixing of the ore and quicksilver, bringing the quicksilver into contact with every part of the ore, so that all the gold and silver will be removed therefrom. The same inventor has likewise obtained a patent for a machine for pulverizing ores, adapted for either dry or wet crushing; the case is lined with steel plates to form the wearing surface, and the grinders are moved out by centrifugal action and gravity against the sides and lower part of the shell, thus crushing and pulverizing the material.

NEW BOOKS AND PUBLICATIONS.

HISTORY OF THE KINGDOM OF COTTON, AND COTTON STATISTICS OF THE WORLD. By Morris R. Chew. New Orleans: W. B. Stansbury and Co., 1884.

This little brochure on cotton statistics and the cotton producing countries was evidently written with an eye to the New Orleans Exposition, for the purpose of providing a convenient morsel of cotton literature. It has been presented to the public with the hearty indorsement of various officials of the cotton exchanges in New Orleans, and even of the Exposition itself, but although the historical part possesses some interest, and the statistics are presumably reliable, the general style, and particularly the illustrations, leave much to be desired. The book is not to the point. One must be charitable to appreciate even what is good, for the accompanying matter is often so irrelevant as to become amusing. The author has, however, been at some pains to collect his information, and greater discrimination, with more careful editorship, would have made his work of value.

POOR'S MANUAL OF RAILROADS OF THE UNITED STATES, 1885. H. V. & H. W. Poor, New York.

This work, taking the size of the book and its great amount of statistical matter, may appropriately be styled a "dictionary of railways" in all matters of record pertaining to their business growth and financial situation. From its pages we learn that there were 3,977 miles of railroad built in the United States in 1884, against 6,753 miles built in 1883, the total mileage up to December 31 last being 125,379. The net earnings of last year were, however, $25,000,000 below those of 1883, and $4,000,000 below those of 1881, when 23,000 miles of railroad were in operation. Railroad building on speculation, as the result of previous profitable railroading and the extensive "watering" of stocks by many of the older corporations, is given as the principal reason for the great falling off in earnings, as the retroactive effect has undoubtedly been largely the cause of the prolonged dull times in nearly all lines of business.

THE INSURANCE YEAR BOOK, 1885–86. The "Spectator," New York.

This is a handsome volume of statistics of the insurance business, being the thirteenth annual number thereof. A valuable feature is the statistics showing how the cities and villages of the country are equipped for fire protection, and another is found in the chapters giving the statutory requirements of the different States for companies doing business therein.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) C. A. R.—The pitch of a screw is the distance that the outer edge of the blade will travel in one revolution, without slipping, or in a cylindrical groove corresponding to the angle of inclination of the edge of the blade.

(2) F. T. T.—Six mercury flasks arranged as a boiler would be equal to ⅓ horse power, and would run an engine with 1¼x3 inch cylinder, but not to its full capacity. Use ¾ inch pipe for connections for both water and steam. A steam gauge and safety valve are always necessary on a boiler.

(3) W. C. R.—A ball thrown across a moving railway car will pass across the car in the precise direction that it is thrown, exactly as if the car was not moving. Its movement in regard to the ground makes quite a different figure. It will move in a diagonal direction with the track, of which the speed of the ball will be represented by one leg, and the speed of the car by the other leg of a right angle triangle, the hypothenuse representing the direction of the ball.

(4) "Molder" asks how to make a mould to cast chilled iron runners about 2 inches diameter. A. By placing a bar of iron in the mould, so that the molten iron will run in contact with the chill bar.

(5) A. J. C.—The first steel rail was made in 1857 by "Mushet" at the Ebbwvale Iron Company's Works in South Wales, and put on trial. Two steel rails were laid on trial in 1862, on an English railway, after which they came rapidly into use both in England and the United States.

(6) J. S. asks how to make the white cement or pointing that is used on the front of granite buildings to make the nice white seams. A. Use equal parts hydraulic cement (Portland), lime, and fine white sand.

(7) J. W. A. asks: Is there any chemical that will deodorize cistern water, rendered offensive on account of a wooden pump? A. Know of nothing better than thorough cleaning out of cistern; take out pump, clean and dry it, then give it a coat of melted

resin, inside and outside; drive in the resin with a hot iron. Any chemicals will either make the water hard or add to the odor of goods washed in it.

(8) W. S. R.—Cut dogwood in winter. To dry, heat in a drying room with open steam until the sap is cooked, then continue the heat by steam coils or otherwise, with a little ventilation, until thoroughly dry. The drying should not be hurried; 4 to 6 days is not too much time for good results.

(9) C. S. P. asks: Is it practical to use steam heating apparatus under a pressure of say 40 pounds steam, for power, and also to heat building needing some 1,800 feet of pipe, at same time returning water to boiler by gravity, without traps or pumps? A. Yes, provided the conditions for a gravity system are observed. For these it is advisable to consult with a steam heating engineer.

(10) T. K.—Gas should be furnished to the burner under a pressure of ⅝ inch water pressure to be effective and economical. The pressure in the service pipes varies from 1 inch to 2 inches water pressure under the varying circumstances of shutting off or turning on of a large number of lights. The variation of the measure of the meter is too small for serious consideration under so slight a difference as 1 or 2 inches of water pressure.

(11) E. R. writes: I am about to build an engine; the cylinder is to be 4½x2½; what size boiler will I need? If made of one-sixteenth inch copper, what would it safely stand? What should be size of fly wheel, and what would be the power of such an engine? A. Your engine will be equal to a ½ horse power, and will require a boiler containing 9 square feet effective fire surface. A horizontal boiler 14 inches diameter, 2 feet long, lower half filled with 1 inch tubes in the same proportion as you will see by examining any horizontal tubular boiler. The shell should be made of ⅜ copper, riveted and brazed; head should be ¼ inch thick. The tubes may be one-sixteenth inch, well expanded and edges turned. Three stay bolts, from head to head above the tubes, should be arranged to divide the space equally. If such a boiler is well made, it should be safe for 40 pounds working pressure. It should be made by a coppersmith that understands his business. Fly wheel may be 12 inches diameter and weigh 25 pounds.

(12) W. W. K.—A direct line pipe for water is always the best for economy in material, for tightness, and a large saving in friction. You can easily force water through 900 feet of pipe. To use it as a suction pipe will be rather difficult, from the great quantity of air to be pumped out and liability to lose the charge by leakage. You will, if the pipe be used as a suction, require a larger pump than usual and a good foot valve at the spring, and also will probably have to charge the pump and suction with water at the start.

(13) A. B. J. asks: 1. Has electricity ever been utilized for heating purposes to any practical extent, such as fusing metals, or the fusing of ores for making iron, such as is made in blast furnaces? A. No. 2. Do you consider it practicable that it can be so used? And could it be transmitted to the distance of 10 miles with any degree of certainty and regularity? A. It is not possible by any means at present known. 3. What is the relative heating power of gas as compared with coal, that is, how much coal is equal to say 10,000 feet of gas for heating purposes? A. About 1,500 pounds bituminous coal. Different coals vary very much in heating quality.

(14) C. A. L. asks if there is any way to make the hair turn gradually and permanently gray. A. No. The hair turns gray in the disappearance of the pigment from the hair, generally in consequence of age. You can bleach your hair with hydrogen peroxide. In this manner a very light color can be obtained.

(15) L. A. D. asks the cause of brewers' horses being so strong, and powerful, and fat. A. The horses are well selected from costly stock, and fed on best feed, not on the mash sold for feeding cows. Some of these horses are also great beer drinkers.

(16) C. H. F. asks: What are the composition and ingredients used in the manufacture of Cutler's carbolate of iodine inhalant? A. The following formula is considerably used; whether it is the specific make desired, we are unable to say:

Compound tincture of iodine	180	minims.
Carbolic acid No. 1	48	"
Glycerine	1	fl. oz.
Water	5	" "

Mix and expose to the sunlight until the mixture is entirely colorless. The proportion of carbolic acid and tincture of iodine may be largely increased without a corresponding addition of glycerine.

(17) F. W. P.—Parchment paper is made by dipping ordinary unsized paper for 5 or 6 seconds in dilute sulphuric acid, and then washing with extremely weak ammonia.

(18) R. H. K. desires a remedy for sun burn. A. Take 6 drachms avoirdupois powdered borax, pure glycerine ¼ ounce, rose water or elder flower water 12 ounces; mix. Its daily use as a cosmetic wash renders the skin beautifully soft and white, and prevents and removes chaps, sun burns, etc.

(19) C. A. S. writes: 1. Can you tell me why an iron smokestack rusts through quicker in the city than in the country? A. City air is always more corrosive, on account of the acids, etc., which are present in the atmosphere. 2. The ingredients in the Hamlin Wizard Oil? A. The formula for this article is given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 342.

(20) H. M. D. asks for a method employed in embalming (or preserving without stuffing) birds, animals, etc. A. By consulting the article on "Embalming the Dead," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 155, you will find the general *modus operandi* given. The solutions vary with different authorities. The following is one that has been extensively used in Paris: Mix together 5 pounds dry sulphate of alumina, 1 quart warm water, and 100 grains arsenious acid. Inject 3 or 4 quarts of this mixture into all the vessels of the body. This process is applicable to fish as well as birds and animals.

(21) J. S. Y. asks for information as to how black lead is cemented in the construction of crucibles, etc. A. After the graphite is ground to powder, it is mixed with a small proportion of china clay, varying according to the use for which the crucible is intended. To every 10 parts of graphite is also added 7 parts of a gray (Bavarian) clay, besides a little ground charcoal. These ingredients are mixed dry; water is afterward added, and the compound passes to a cast iron cylinder. After treatment in this apparatus the material emerges in the form of thick mud, and is at once moulded either by hand or machinery, the operation being performed in almost exactly the same way as by potters. The same may be said of the subsequent baking.

(22) F. H. W. asks (1) for a good recipe for making sticky fly paper to catch them alive. A. To one pound of resin add two fluid drachms of linseed oil. While the mixture is warm, spread it on foolscap paper. 2. How much mercury, either in cubic or weight measurement, confined in a glass bulb at base of glass tube ¼ inch diameter inside of tube, will raise the column of mercury in tube one inch in height at an increase of the temperature of but 5 degrees? A. Approximately, 100 cubic inches of mercury. 3. How much force in pounds or ounces would the mercury give on a piston inserted in the tube and in contact with the mercury, without danger of breaking glass tube or bulb of ordinary tubes of that size? A. The force would be very great; its development would depend on the thickness of the glass tube and bulb.

(23) G. D. S. asks: 1. What is the best method for hulling corn? A. The hull may be removed by beating in a mortar, or on a large scale by machinery. Corn may also be hulled by allowing it to soak over night in a dilute solution of lye. Any excess of lye can be removed by washing. 2. Can the Pyrethrum roseum, from which the Persian insect powder is manufactured, be successfully grown in the climate of Canada? A. The season is probably too short for cultivation in Canada. 3. What authority can I consult with reference to its cultivation? A. See "The Cultivation of Pyrethrum and Manufacture of the Powder," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 299. As to your query about preserving eggs, it is best to coat the eggs in such a way that air cannot penetrate the shell. Paraffin is an excellent article for this purpose. See also "How to Preserve Eggs for the Market," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 317.

(24) W. R. E. writes: Can you give me a process for making walks with gravel and coal tar, or whatever they use for that purpose? Want something that will set hard for a workshop floor, and resist water. A. Take 2 parts very dry lime rubbish and 1 part coal ashes, also very dry, and both sifted fine. In a dry place, on a dry day, mix them, and leave a hole in the middle of the heap as bricklayers do when making mortar. Into this pour boiling hot coal tar; mix, and when as stiff as mortar put in three inches thick where the walk is to be; the ground should be dry, and beaten smooth; sprinkle over it coarse sand. When cold, pass a light roller over it; in a few days the walk will be solid and waterproof. See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 82, under title of "The Best Footwalk Pavement," also Gen. Gillmore's "Treatise on the Construction of Roads, Streets, and Pavements" is an excellent work; we can send you for $2.

(25) H. S. D. asks if nasal gleet in horses is contagious. Is there any remedy for it? If so, what is the best, and how given? A. The disease is not a contagious one. The usual treatment consists of the injection of an astringent solution of carbolic acid, or else of copper sulphate or zinc sulphate, through the maxillary sinus. As this operation is a delicate one, it is best performed under the direction of a verterinary surgeon. 2. Have they got the lenses of the Lick telescope perfected yet? Would it be possible to clarify obsidian? It appears to be very fine glass, but dark? A. The lenses are being manufactured under the direction of Messrs. Alvan Clark & Sons. Glass seems to have the best qualifications for lenses. It is doubtful if a piece of obsidian could be procured of suitable dimensions and quality for the lens, independent of its color.

(26) J. W. W. writes: I have two powdered substances; one I think is powdered borax, the other bicarbonate of soda. Will you please tell me how I can test them, to be sure as to the correctness of my experiments with them? A. If alcohol is poured over borax, with addition of a sufficient quantity of sulphuric acid to liberate the boric acid, and the alcohol is kindled, the flame appears of a very distinct yellowish green color, especially upon stirring the mixture; this tint is imparted to the flame by the boric acid, which volatilizes with the alcohol. The effervescence of sodium bicarbonate with an acid is one of the tests used to determine the desired mineral.

(27) J. W. asks (1) a good remedy for taking moles from the face. A. Croton oil under the form of pomade or ointment, and tartar emetic under the form of paste or plaster, have each been successfully employed for the removal of moles or birthmarks, thus: Take tartar emetic in impalpable powder 15 grains, soap plaster 1 drachm, and beat them to a paste. Apply this paste to nearly a line in thickness (not more), and cover the whole with strips of gummed paper. In 4 or 5 days eruption or suppuration will set in, and in a few days leave in place of the birthmark only a very slight scar. 2. A good remedy for removing freckles?

A. Sulphocarbolate of zinc	1	ounce.
Glycerine	12	"
Rose water	12	"
Alcohol	3	"
Spirits of neroli	½	dm.

Mix them. To be applied twice a day, leaving them on from half an hour to one hour.

(28) P. & Co. ask (1) whether cistern water that is caught from an iron or tin roof that is painted every year is unhealthy. A. The water does not necessarily become impure from its passage over a painted roof, but it is very likely to become so by dissolving out certain injurious constituents of the paints, such as lead, etc. 2. The probable age of a catfish that will weigh 50 pounds? A. There are so many variations within each species of fish that there is no general rule of determining age by weight; and in fishes closely conforming to the species the rate of growth is extremely irregular, depending on amount of food and the more or less favorable circumstances. Some kinds of catfish attain to a weight as great as 300 pounds. Fish which rapidly grow to a definite size are short-lived, while those which steadily and slowly increase in size attain to a great age. Carp and pike have been ascertained to live beyond a hundred years.

(29) C. F. asks if the piston head to a locomotive engine works back and forward itself in the cylinder, or is it always on the forward motion, caused by the cylinder moving away from it. A. It always moves forward relatively to the rails, but back and forward relatively to the cylinder.

(30) W. C. B. asks if there is any receipt for making a cement to fasten a rubber tire on a bicycle that will be strong and yet flexible. A. Use ordinary rubber cement prepared as follows: Digest crude rubber cut fine with about four volumes coal tar, benzol, or naphtha in a well covered vessel for several days.

(31) C. F. R. writes: I am using paraffine varnish for painting the iron parts of machinery black. When the paint or varnish becomes too thick for use, what shall I mix with it to make it thinner? A. Thin down with benzine. The paraffine varnish consists of coal tar boiled down, with the addition of sufficient asphaltum to harden the mixture, and then benzine is added to thin it.

(32) A. P. A. asks how the inside of a cask or barrel can be treated so it will not make water taste, the water supposed to be medicinal. A. Coat the inside of your barrel with a lining of paraffine. This substance is not soluble at all in water, and, if properly applied to the wood, will prevent the contact of water with the barrel. To keep the water on account of its medicinal qualities should demand its immediate preservation in glass bottles.

(33) B. J. R. asks (1) how to make pear phosphates. A. Take Bartlett or other good pears; cut or chop fine, press, allow to settle, pour off supernatant liquid. To one pint of this pear juice add one pint acid phosphate and one pound sugar or enough to sweeten. 2. Is there anything in the least unhealthful in carbonating water by means of marble dust and sulphuric acid, etc., even if the water so carbonated is drunk freely? A. The method suggested is the one ordinarily used in the manufacture of carbonic acid for soda water, and when it is properly done, and the water held in proper vessels, is not considered unhealthful.

(34) F. M. Z. desires a good recipe to make Florida water. A. Dissolve in ½ gallon 90 per cent alcohol 1 ounce each oil of lavender, oil of bergamot, and oil of lemons, and of oil of cloves and cinnamon, 1 drachm each; add 1 gallon water and filter. Or, take of oil of bergamot, 3 ounces; oil of cinnamon, 4 drachms; tincture of benzoin, 2 ounces; 75 per cent alcohol, 1 gallon. Mix and filter.

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August 11, 1885,

AND EACH BEARING THAT DATE.

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